DIAGNOSTICS AND TROUBLESHOOTING GUIDE

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Safety Instructions

Use the following safety guidelines to help protect your computer system from potential damage and to ensure your own personal safety.

When Using Your Computer System

As you use your computer system, observe the following safety guidelines:

- To help avoid damaging your computer, be sure the voltage selection switch on the power supply is set to match the alternating current (AC) power available at your location:
  - 115 volts (V)/60 hertz (Hz) in most of North and South America and some Far Eastern countries such as Japan, South Korea, and Taiwan
  - 230 V/50 Hz in most of Europe, the Middle East, and the Far East

  Also be sure your monitor and attached peripherals are electrically rated to operate with the AC power available in your location.
- To help avoid possible damage to the system board, wait 5 seconds after turning off the system before removing a component from the system board or disconnecting a peripheral device from the computer.
- To help prevent electric shock, plug the computer and peripheral power cables into properly grounded power sources. These cables are equipped with 3-prong plugs to help ensure proper grounding. Do not use adapter plugs or remove the grounding prong from a cable. If you must use an extension cable, use a 3-wire cable with properly grounded plugs.
- To help protect your computer system from sudden, transient increases and decreases in electrical power, use a surge suppressor, line conditioner, or uninterruptible power supply (UPS).
- Be sure nothing rests on your computer system's cables and that the cables are not located where they can be stepped on or tripped over.
- Do not spill food or liquids on your computer. If the computer gets wet, see "Troubleshooting a Wet Computer" in Chapter 6.
- Do not push any objects into the openings of your computer. Doing so can cause fire or electric shock by shorting out interior components.
- Keep your computer away from radiators and heat sources. Also, do not block cooling vents. Avoid placing loose papers underneath your computer, and do not place your computer in a closed-in wall unit or on a bed, sofa, or rug.

When Working Inside Your Computer

Before you remove the computer cover, perform the following steps in the sequence indicated.

CAUTIONS: Do not attempt to service the computer system yourself, except as explained in this guide and elsewhere in Dell documentation. Always follow installation and service instructions closely.

To help avoid possible damage to the system board, wait 5 seconds after turning off the system before removing a component from the system board or disconnecting a peripheral device from the computer.

1. **Turn off your computer and any peripherals.**
2. **Disconnect your computer and peripherals from their power sources. Also, disconnect any telephone or telecommunication lines from the computer.**

   Doing so reduces the potential for personal injury or shock.
3. **Touch an unpainted metal surface on the chassis, such as the metal around the card-slot openings at the back of the computer, before touching anything inside your computer.**

   While you work, periodically touch an unpainted metal surface on the computer chassis to dissipate any static electricity that might harm internal components.

In addition, take note of these safety guidelines when appropriate:

- When you disconnect a cable, pull on its connector or on its strain-relief loop, not on the cable itself. Some cables have a connector with locking tabs; if you are disconnecting this type of cable, press in on the locking tabs before disconnecting the cable. As you pull connectors apart, keep them evenly aligned to avoid bending any connector pins. Also, before you connect a cable, make sure both connectors are correctly oriented and aligned.
- Handle components and cards with care. Don't touch the components or contacts on a card. Hold a card by its edges or by its metal mounting bracket. Hold a component such as a microprocessor chip by its edges, not by its pins.

WARNING

There is a danger of a new battery exploding if it is incorrectly installed. Replace the battery only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.

Protecting Against Electrostatic Discharge

Static electricity can harm delicate components inside your computer. To prevent static damage, discharge static electricity from your body before you touch any of your computer's electronic components, such as the microprocessor. You can do so by touching an unpainted metal surface on the computer chassis.

As you continue to work inside the computer, periodically touch an unpainted metal surface to remove any static charge your body may have accumulated.

You can also take the following steps to prevent damage from electrostatic discharge (ESD):

- When unpacking a static-sensitive component from its shipping carton, do not remove the component from the antistatic packing material until you are ready to install the component in your computer. Just before unwrapping the antistatic packaging, be sure to discharge static electricity from your body.
- When transporting a sensitive component, first place it in an antistatic container or packaging.
- Handle all sensitive components in a static-safe area. If possible, use antistatic floor pads and workbench pads.

The following caution may appear throughout this document to remind you of these precautions:

CAUTION: See "Protecting Against Electrostatic Discharge" in the safety instructions at the front of this guide.

Preface

About This Guide

This guide provides directions for troubleshooting problems that have temporarily disabled your Dell computer system. It does not matter how much you do or do not know about your system—this guide can help you. Before calling for technical assistance, follow the recommended procedure(s) in this guide to solve many hardware and software problems yourself. The chapters and appendixes are summarized as follows:

- Everyone should read Chapter 1, "Checking the Basics," for some initial checks and procedures that can be used to solve basic computer problems. It also directs you to the appropriate chapter in this guide for more detailed troubleshooting information and procedures to solve more complex problems.
- Whenever you receive an error message or code, you should read Chapter 2, "Messages and Codes." This chapter discusses system messages, system beep codes, warning messages, and diagnostics messages.
- If you suspect that your problems are software-related, or you are still having problems after testing your computer's hardware, read Chapter 3, "Finding Software Solutions." It provides some general guidelines for analyzing software problems.
- For hardware-related problems, read Chapter 4, "Running the Dell Diagnostics." Chapter 5, "Checking Your Equipment," and Chapter 6, "Checking Inside Your Computer," provide troubleshooting procedures for equipment connected to the input/output (I/O) panel of your computer and components inside your computer, respectively.
- Chapter 7, "Getting Help," describes the help tools Dell provides to assist you should you have a problem with your computer system. It also explains how and when to call Dell for technical assistance. Make a copy of the Diagnostics Checklist in Chapter 7 and fill it out as you perform the troubleshooting procedures. If you need to call Dell for technical assistance, use the completed checklist to tell the support technician what procedures you performed to better help the technician give you assistance. If you must return a piece of hardware to Dell, include a filled-out checklist.
- Appendix A, "Diagnostic Video Tests," discusses the tests for the Video Test Group in the Dell Diagnostics to help you test your monitor.
- A table of the abbreviations and acronyms used throughout this guide and in other Dell documentation for your system precedes the Index.

Warranty and Return Policy Information

Dell Computer Corporation ("Dell") manufactures its hardware products from parts and components that are new or equivalent to new in accordance with industry-standard practices. For information about the Dell warranty, see the appendix titled "Warranties and Return Policy" in your system documentation.

Other Documents You May Need

You may need to reference the following documentation when performing the procedures in this guide:

- Your system documentation describes system features, explains the System Setup program, explains the ISA Configuration Utility or EISA Configuration Utility (whichever is provided with your system),

tells how to install internal options, and also provides technical specifications for your computer system. On some systems, some of this information is provided in online form in the Dell Accessories group.

- The *Getting Started* sheet (which accompanies only certain systems) provides step-by-step instructions for setting up your computer system.
- The *Frequently Asked Questions* cards (which accompany only certain systems) provide detailed answers to questions that are often asked by Dell computer users. Be sure to read these cards before calling Dell for technical assistance.
- Operating system documentation is included with your system if you ordered your operating system software from Dell. This documentation describes how to install (if necessary), configure, and use your operating system software.
- Documentation is included with any options you purchase separately from your system. This documentation includes information that you need to configure and install these options in your Dell computer. Installation instructions for the options are included in your system documentation.
- The *SCSI Device Driver Installation and Configuration Guide* contains information required when installing SCSI devices on your system.
- The *Dell SCSI Array User's Guide* provides instructions that you need to run the DSA Manager program when troubleshooting SCSI disk drives.
- Technical information files—sometimes called "readme" files—may be installed on your hard-disk drive to provide last-minute updates about technical changes to your system or advanced technical reference material intended for experienced users or technicians.

NOTE: Documentation updates are sometimes included with your system to describe changes to your system or software. Always read these updates ***before*** *consulting any other documentation because the updates often contain information that supersedes the information in the other documents.*

Notational Conventions

The following subsections list notational conventions used in this document.

Warnings, Cautions, and Notes

Throughout this guide, there may be blocks of text printed in bold type within boxes or in italic type. These blocks are warnings, cautions, and notes, and they are used as follows:

WARNING: A WARNING indicates the potential for bodily harm and tells you how to avoid the problem.

CAUTION: A CAUTION indicates either potential damage to hardware or loss of data and tells you how to avoid the problem.

NOTE: A NOTE indicates important information that helps you make better use of your computer system.

Typographical Conventions

The following list defines (where appropriate) specific elements of text and illustrates the typographical conventions used throughout this document as visual cues for those elements:

- *Keycaps*, the labeling that appears on the keys on a keyboard, are enclosed in angle brackets.

  Example: <Enter>

- *Key combinations* are series of keys to be pressed simultaneously (unless otherwise indicated) to perform a single function.

  Example: <Ctrl><Alt><Enter>

- *Commands* presented in lowercase bold are for reference purposes only and are not intended to be typed when referenced.

  Example: "Use the **format** command to . . . ."

In contrast, commands presented in the Courier New font are part of an instruction and intended to be typed.

Example: "Type `format a:` to format the diskette in drive A."

- *Filenames* and *directory names* are presented in lowercase bold.

  Examples: **autoexec.bat** and **c:\windows**

- *Syntax lines* consist of a command and all its possible parameters. Commands are displayed in lowercase bold; variable parameters (those for which you substitute a value) are displayed in lowercase italics; constant parameters are displayed in lowercase bold. The brackets indicate items that are optional.

  Example: **del** [*drive*:] [*path*] *filename* [**/p**]

- *Command lines* consist of a command and may include one or more of the command's possible parameters. Command lines are presented in the Courier New font.

  Example: `del c:\myfile.doc`

- *Screen text* is text that appears on the screen of your monitor or display. It can be a system message, for example, or it can be text that you are instructed to type as part of a command (referred to as a *command line*). Screen text is presented in the Courier New font.

  Example: The following message appears on your screen:

  `No boot device available`

  Example: "Type `md c:\dos` and press <Enter>."

- *Variables* are placeholders for which you substitute a value. They are presented in italics.

  Example: SIMM*n* (where *n* represents the SIMM socket designation)

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Chapter 1
Checking the Basics

If your Dell® computer system is not working as expected, and if you are not sure what to do, start your troubleshooting with the procedures in this chapter. This chapter guides you through some initial checks and procedures that can solve basic computer problems. It can also direct you to the appropriate chapter in this guide for detailed troubleshooting information and procedures to solve more complex problems.

NOTE: When you see the question, "Is the problem resolved?" *in a troubleshooting procedure, perform the operation that caused the problem to see if the problem recurs.*

Backing Up Your Files

You can lose data when a system failure occurs. If your system is behaving erratically, back up your files immediately.

If you are using MS-DOS®, use the **msbackup** command to copy your files onto diskettes to safeguard your data. See your MS-DOS documentation for instructions on using the **msbackup** command.

If Dell installed MS-DOS on your hard-disk drive, you should also safeguard your software by creating program diskette sets (backup diskettes) of the operating system and application programs with Dell's Program Diskette Maker utility.

If you are using an operating system other than MS-DOS, see the documentation that came with your operating system for instructions on how to back up your files.

Basic Checks

The following procedure leads you through the checks necessary to solve some basic computer problems:

1. **Is your computer wet or damaged?**

   Yes. Go to Chapter 6, "Checking Inside Your Computer."

   No. Go to step 2.

2. **Perform the steps in "Checking Connections and Switches" found later in this chapter.**

   Is the problem resolved?

   Yes. The power to your computer system was faulty, or the connections to your computer system were loose. You have fixed the problem.

   No. Go to step 3.

3. **Perform the steps in "Look and Listen" found later in this chapter.**

   Did your computer system complete the start-up (boot) routine?

   NOTE: The boot routine is the operating system's attempt to load its files into memory from the boot-up sector on the hard-disk drive or bootable diskette.

   Yes. Go to step 4.

   No. A serious malfunction may have occurred. Go to Chapter 7, "Getting Help."

4. **Did you receive a system message or beep code?**

   Yes. If your system documentation contains an appendix titled "Beep Codes and System Messages," go to that appendix. Otherwise, go to Chapter 2, "Messages and Codes," in this guide.

   No. Go to step 5.

5. **Verify the settings in the System Setup program as explained in "The System Setup Program" found later in this chapter.**

   Is the problem resolved?

   Yes. The system configuration information was incorrect. You have fixed the problem.

   No. Go to step 6.

6. **Do you have an Extended Industry-Standard Architecture (EISA) computer system?**

   Yes. Go to step 7.

   No. Go to step 8.

7. **Use the EISA Configuration Utility to save new system information into EISA configuration memory as explained in "The EISA Configuration Utility" found later in this chapter.**

   Is the problem resolved?

   Yes. The EISA configuration information and the system configuration information conflicted. You have fixed the problem.

   No. Go to step 8.

8. **Go to Chapter 4, "Running the Dell Diagnostics."**

Checking Connections and Switches

Improperly set switches and controls, and loose or improperly connected cables, are the most likely source of problems for your computer, monitor, or other peripheral (such as a printer, keyboard, mouse, or other external equipment). A quick check of all the switches, controls, and cable connections can easily solve these problems.

NOTE: See your system documentation for the location of your computer's external connections and switches.

Complete the following procedure to check all the connections and switches:

1. **Turn off the system, including any attached peripherals (such as the monitor, keyboard, printer, external drives, scanners, or plotters). Disconnect all the alternating current (AC) power cables from their power sources.**

2. **If your computer is connected to a power strip, turn the power strip off and then on again.**

   Is the power strip getting power?

   Yes. Go to step 5.

   No. Go to step 3.

3. **Plug the power strip into another electrical outlet.**

   Is the power strip getting power?

   Yes. The original electrical outlet probably does not function. Use a different electrical outlet.

   No. Go to step 4.

4. **Plug a lamp that you know works into the electrical outlet.**

   Does the lamp get power?

   Yes. The power strip is probably not functioning properly. Get another power strip.

   No. Go to step 5.

5. **Reconnect the system to AC power.**

   Make sure that all connections fit tightly together.

6. **Turn on the system.**

   Is the problem resolved?

   Yes. The connections were loose. You have fixed the problem.

   No. Go to step 7.

7. **Is your monitor operating properly?**

   Yes. Go to step 8.

   No. Go to "Troubleshooting the Monitor" in Chapter 5.

8. **Is your keyboard operating properly?**

   Yes. Go to step 9.

   No. Go to "Troubleshooting the Keyboard" in Chapter 5.

9. **Is your mouse or printer operating properly?**

   Yes. Continue with "Look and Listen" found next in this chapter.

   No. Go to "Troubleshooting I/O Ports" in Chapter 5.

Look and Listen

Looking at and listening to your system is important in determining the source of a problem. Look and listen for the indications described in Table 1-1.

If after looking and listening to your computer you have not resolved the problem, continue with "The System Setup Program" found next in this chapter.

Table 1-1. Boot Routine Indications

Look/Listen for:	Action
An error message	If your system documentation contains an appendix titled "Beep Codes and System Messages," see that appendix. Otherwise, see Chapter 2, "Messages and Codes," in this guide.
The monitor's power indicator	Most monitors have a power indicator (usually on the front bezel). If the monitor's power indicator does not light up, see "Troubleshooting the Monitor" in Chapter 5.
The keyboard indicators	Most keyboards have one or more indicators (usually in the upper-right corner). Press the <Num Lock> key, the <Caps Lock> key, and the <Scroll Lock> key to toggle the keyboard indicators on and off. If the keyboard indicators do not light up, see "Troubleshooting the Keyboard" in Chapter 5.
The diskette-drive access indicator	The diskette-drive access indicator should quickly flash on and off when you access data on the diskette drive. On a system running a Microsoft® Windows® operating system, you can test the drive by opening Windows Explorer (in Windows 95 or Windows NT® 4.0) or File Manager (in Windows 3.*x* or Windows NT 3.51) and clicking on the icon for drive A. On a system running MS-DOS, you can test the drive by inserting a diskette into the drive, typing `dir a:`, and pressing <Enter>. If the diskette-drive access indicator does not light up, see "Troubleshooting the Diskette/Tape Drive Subsystem" in Chapter 6.
The hard-disk drive access indicator	The hard-disk drive access indicator should quickly flash on and off when you access data on the hard-disk drive. On a system running a Windows operating system, you can test the drive by opening Windows Explorer (in Windows 95 or Windows NT 4.0) or File Manager (in Windows 3.*x* or Windows NT 3.51) and clicking on the icon for drive C. On a system running MS-DOS, you can test the drive by typing `dir c:` and pressing <Enter>. If the hard-disk drive access indicator does not light up, see "Troubleshooting Hard-Disk Drives" in Chapter 6.
A series of beeps	If your system documentation contains an appendix titled "Beep Codes and System Messages," see that appendix. Otherwise, see Chapter 2, "Messages and Codes," in this guide.
An unfamiliar constant scraping or grinding sound when you access a drive	Make sure the sound is not caused by the application program you are running. The sound could be caused by a hardware malfunction. See Chapter 7, "Getting Help," for instructions on getting technical assistance from Dell.
The absence of a familiar sound	When you turn on your system, you can hear the hard-disk drive spin up, and the system tries to access the boot files from the hard-disk drive or the diskette drive. If your system boots, see Chapter 4, "Running the Dell Diagnostics." If your system does not boot, see Chapter 7, "Getting Help."

The System Setup Program

You can easily correct certain system problems by verifying the correct settings in the System Setup program. When you boot your system, your system checks the system configuration information and compares it with the current hardware configuration. If your system hardware configuration doesn't match the information recorded by the System Setup program, an error message may appear on your screen.

This problem can happen if you changed your system's hardware configuration and forgot to run the System Setup program. To correct this problem, enter the System Setup program, correct the corresponding System Setup program category, and reboot your system. See your system documentation for detailed instructions on using the System Setup program.

If after checking the settings in the System Setup program you have not resolved the problem, determine whether you have an EISA system. If you have an EISA system, see "The EISA Configuration Utility" found next in this chapter. If you do not have an EISA system, see Chapter 4, "Running the Dell Diagnostics."

The EISA Configuration Utility

If you have a system that can use EISA expansion cards, and if you are experiencing problems with your system, you may have a conflict between the information stored by the System Setup program and the EISA Configuration Utility. Although the EISA Configuration Utility can read changes from the System Setup program, the change is not recorded into EISA configuration memory until you run the EISA Configuration Utility and save the new information. See your system documentation for detailed instructions on using the EISA Configuration Utility and saving new information.

If after using the EISA Configuration Utility you have not resolved the problem, see Chapter 4, "Running the Dell Diagnostics."

Chapter 2
Messages and Codes

Your application programs, operating system, and the computer itself are capable of identifying problems and alerting you to them. When a problem occurs, a message may appear on your monitor screen, or a beep code may sound.

Several different types of messages can indicate when your system is not functioning properly:

- System messages
- System beep codes
- Warning messages
- Diagnostics messages

This chapter describes each type of message and lists the possible causes and actions you can take to resolve any problems indicated by a message. To determine what type of message you have received, read the following sections.

NOTE: If your system documentation contains an appendix titled "Beep Codes and System Messages," refer to that appendix rather than this chapter for the beep codes and system messages produced by your system.

System Messages

System messages are generated by your computer. They alert you to a possible operating problem or to a conflict between your software and hardware. If you receive a system message, see Table 2-1 for suggestions on resolving any problems indicated by the message. The system messages are listed alphabetically. If you have a Dell PowerEdge® system, refer to the chapter titled "Messages and Codes" in your *Installation and Troubleshooting Guide*.

NOTE: If the system message you received is not listed in the appropriate table, check the documentation for the application program that you were running at the time the message appeared and/or the operating system documentation for an explanation of the message and a recommended action.

Table 2-1. System Messages

Message	Cause	Action
`Address mark not found`	The BIOS found a faulty disk sector or could not find a particular disk sector.	See "Troubleshooting the Diskette/Tape Drive Subsystem" in Chapter 6.
`Attachment failed to respond`	The diskette drive or hard-disk drive controller cannot send data to the associated drive.	See "Troubleshooting the Diskette/Tape Drive Subsystem" in Chapter 6.

NOTE: For the full name of an abbreviation or acronym used in this table, see the abbreviation and acronym list that precedes the Index.

Table 2-1. System Messages (continued)

Message	Cause	Action
`Bad command or file name`	The command you entered does not exist or is not in the pathname you specified.	Make sure you have spelled the command correctly, placed spaces in the proper location, and used the correct pathname.
`Bad error-correction code(ECC) on disk read`	The diskette drive or hard-disk drive controller detected an uncorrectable read error.	See "Troubleshooting the Diskette/Tape Drive Subsystem" in Chapter 6.
`Controller has failed`	The hard-disk drive or the associated controller is defective.	
`Data error`	The diskette or hard-disk drive cannot read the data.	Run the ScanDisk utility in the Microsoft Windows 95 operating system or the **chkdsk** utility in MS-DOS to check the file structure of the diskette or hard-disk drive. See your operating system documentation for more information. If you are using another operating system, run the appropriate utility to check the file structure of the diskette or hard-disk drive. See your operating system documentation.
`Decreasing available memory`	One or more SIMMs or DIMMs may be faulty or improperly seated.	See "Troubleshooting System Memory" in Chapter 6.
`Diskette drive 0 seek failure` `Diskette drive 1 seek failure`	A cable may be loose, or the system configuration information may not match the hardware configuration.	See "Troubleshooting the Diskette/Tape Drive Subsystem" in Chapter 6.
`Diskette read failure`	A cable may be loose, or the diskette may be faulty.	See "Troubleshooting the Diskette/Tape Drive Subsystem" in Chapter 6.
`Diskette subsystem reset failed`	The diskette drive controller may be faulty.	Run the Diskette Drive(s) Test in the Dell Diagnostics. See Chapter 4, "Running the Dell Diagnostics."
`Drive not ready`	No diskette is in the drive. The operation requires a diskette in the drive before it can continue.	Put a diskette in the drive or close the drive latch.

NOTE: For the full name of an abbreviation or acronym used in this table, see the abbreviation and acronym list that precedes the Index.

Table 2-1. System Messages *(continued)*

Message	Cause	Action
`Diskette write protected`	The diskette write-protect feature is activated.	Remove the diskette from drive A and move the write-protect tab to the unlocked position.
`Gate A20 failure`	One or more SIMMs or DIMMs may be loose.	See "Troubleshooting System Memory" in Chapter 6.
`General failure`	The operating system is unable to carry out the command.	This message is usually followed by specific information—for example, `PRINTER OUT OF PAPER`. Respond by taking the appropriate action.
`Hard disk configuration error`	The hard-disk drive failed initialization.	See "Troubleshooting Hard-Disk Drives" in Chapter 6.
`Hard disk controller failure` `Hard disk failure` `Hard-disk drive read failure`	The hard-disk drive failed initialization.	See "Troubleshooting Hard-Disk Drives" in Chapter 6.
`Incompatible Processor: CPU0 is B0 step or below!` `Incompatible Processor: CPU1 is B0 step or below!`	An old, unsupported version of the microprocessor is installed. In a single-microprocessor system, CPU0 refers to the system board microprocessor; in a dual-microprocessor system, it refers to the secondary microprocessor on the add-in card. The CPU1 message appears only on a dual-microprocessor system and always refers to the system board microprocessor.	Replace the indicated microprocessor with a current version of the microprocessor. If you need technical assistance, see Chapter 7, "Getting Help." *NOTE: These messages indicate a fatal error. When a fatal error occurs, the system usually cannot be rebooted until an appropriate hardware change has been made.*

NOTE: For the full name of an abbreviation or acronym used in this table, see the abbreviation and acronym list that precedes the Index.

Table 2-1. System Messages *(continued)*

Message	Cause	Action
`Incompatible Processors: Cache sizes different!`	This message appears for a dual-processor system if both processors do not have the same-size level-2 cache.	Replace one of the microprocessors to make the level-2 cache sizes match. If you need technical assistance, see Chapter 7, "Getting Help." *NOTE: This message indicates a fatal error. When a fatal error occurs, the system usually cannot be rebooted until an appropriate hardware change has been made.*
`Invalid configuration information - please run SETUP program`	The system configuration information does not match the hardware configuration.	Enter the System Setup program and correct the system configuration information. See your system documentation for instructions.
`Keyboard clock line failure` `Keyboard controller failure` `Keyboard data line failure` `Keyboard failure` `Keyboard stuck key failure`	A cable or connector may be loose, or the keyboard or keyboard/mouse controller may be faulty.	See "Troubleshooting the Keyboard" in Chapter 5.
`Memory address line failure at` *address*`, read` *value* `expecting` *value*	One or more SIMMs may be faulty or improperly seated.	See "Troubleshooting System Memory" in Chapter 6.
`Memory allocation error`	The software you are attempting to run is conflicting with the operating system or another application program or utility.	Turn off the computer, wait 30 seconds, and then turn it on. Try to run the program again. If the problem persists, contact the software company.

NOTE: For the full name of an abbreviation or acronym used in this table, see the abbreviation and acronym list that precedes the Index.

Table 2-1. System Messages *(continued)*

Message	Cause	Action
`Memory data line failure at` *address*`, read` *value* `expecting` *value* `Memory double word logic failure at` *address*`, read` *value* `expecting` *value* `Memory odd/even logic failure at` *address*`, read` *value* `expecting` *value* `Memory parity failure at` *address*`, read` *value* `expecting` *value* `Memory write/ read failure at` *address*`, read` *value* `expecting` *value*	One or more SIMMs or DIMMs may be faulty or improperly seated.	See "Troubleshooting System Memory" in Chapter 6.
`Memory size in CMOS invalid`	The amount of memory recorded in the system configuration information does not match the memory installed in the computer.	Reboot the computer. If the error appears again, see Chapter 7, "Getting Help," for instructions on obtaining technical assistance.
`Memory tests terminated by keystroke`	The memory test did not complete.	Rerun the memory test.

NOTE: For the full name of an abbreviation or acronym used in this table, see the abbreviation and acronym list that precedes the Index.

Table 2-1. System Messages (continued)

Message	Cause	Action
`No boot device available`	The computer cannot find the diskette or hard-disk drive.	Enter the System Setup program, check the system configuration information for the diskette and hard-disk drive, and if necessary, correct the information. See your system documentation for instructions.
`No boot sector on hard-disk drive`	The system configuration information in the System Setup program may be incorrect, or the operating system may be corrupted.	Enter the System Setup program, check the system configuration information for the hard-disk drive, and if necessary, correct the information. See your system documentation for instructions. If the message persists, reinstall your operating system. See the documentation that came with your operating system.
`No timer tick interrupt`	A chip on the system board might be malfunctioning.	Run the System Set Test Group in the Dell Diagnostics. See Chapter 4, "Running the Dell Diagnostics."
`Non-system disk or disk error`	The diskette in drive A or your hard-disk drive does not have a bootable operating system installed on it.	A nonbootable diskette is in drive A. Either replace the diskette with one that has a bootable operating system, or remove the diskette from drive A and restart the computer.
`Not a boot diskette`	There is no operating system on the diskette.	Boot the computer with a diskette that contains an operating system.
`Plug and Play Configuration Error`	The system has encountered a problem in trying to configure one or more expansion cards.	Run the ISA Configuration Utility to verify that all ISA expansion cards are configured correctly (see the chapter titled "Using the ISA Configuration Utility" or the chapter titled "Using Configuration Software" in your system documentation. If running the ISA Configuration Utility does not reveal the source of the problem, see "Troubleshooting Expansion Cards" in Chapter 6 of this guide.
`Read fault` `Requested sector not found`	The operating system cannot read from the diskette or hard-disk drive. The system could not find a particular sector on the disk, or the requested sector is defective.	See "Troubleshooting the Diskette/Tape Drive Subsystem" in Chapter 6.

NOTE: For the full name of an abbreviation or acronym used in this table, see the abbreviation and acronym list that precedes the Index.

Table 2-1. System Messages *(continued)*

Message	Cause	Action
`Reset failed`	The disk reset operation failed.	See "Troubleshooting the Diskette/Tape Drive Subsystem" in Chapter 6.
`Sector not found`	The operating system is unable to locate a sector on the diskette or hard-disk drive.	See "Troubleshooting Hard-Disk Drives" or "Troubleshooting the Diskette/Tape Drive Subsystem" in Chapter 6, depending on what type of drive you are accessing.
`Seek error`	The operating system is unable to find a specific track on the diskette or hard-disk drive.	If the error is on the diskette drive, try another diskette in the drive.
`Shutdown failure`	A chip on the system board might be malfunctioning.	Run the System Set Test Group in the Dell Diagnostics. See Chapter 4, "Running the Dell Diagnostics."
`Terminator/ processor card cannot be installed!`	Neither a terminator card nor a secondary microprocessor card is installed in the secondary microprocessor card connector (2ND_CPU).	Make sure either a terminator card or a secondary microprocessor card is installed in the 2ND_CPU connector. Reseat the card and start the system. If errors persist, see Chapter 7, "Getting Help," for instructions on obtaining technical assistance. *NOTE: This message indicates a fatal error. When a fatal error occurs, the system usually cannot be rebooted until an appropriate hardware change has been made.*
`Time-of-day clock stopped`	The battery may be dead.	Enter the System Setup program and correct the date or time. See your system documentation for instructions. If the problem persists, see "Troubleshooting the Battery" in Chapter 6.
`Time-of-day not set`	The time or date displayed in the system configuration information does not match the system clock.	Enter the System Setup program and correct the date or time. See your system documentation for instructions.
`Timer chip counter 2 failed`	A chip on the system board might be malfunctioning.	Run the System Set Test Group in the Dell Diagnostics. See Chapter 4, "Running the Dell Diagnostics."

NOTE: For the full name of an abbreviation or acronym used in this table, see the abbreviation and acronym list that precedes the Index.

Table 2-1. System Messages *(continued)*

Message	Cause	Action
`Unexpected interrupt in protected mode`	The keyboard controller may be malfunctioning, or one or more SIMMs or DIMMs may be loose.	Run the RAM Test Group and the Keyboard Controller Test in the Dell Diagnostics. See Chapter 4, "Running the Dell Diagnostics."
`WARNING: Dell's Disk Monitoring System has detected that drive [0/1] on the [primary/secondary] EIDE controller is operating outside of normal specifications. It is advisable to immediately back up your data and replace your hard-disk drive by calling your support desk or Dell Computer Corporation.`	POST has queried the EIDE drive for status information. The drive has returned a parameter from the call that indicates it has detected possible error conditions for its operating specifications.	Once your computer finishes booting, immediately back up your data and replace your hard-disk drive. Restore the data to the replaced drive. If a replacement drive is not immediately available and the drive is not the only bootable drive, enter the System Setup program and change the appropriate drive setting to None. Remove the drive from the system. This should be done only after you have backed up the data.

NOTE: For the full name of an abbreviation or acronym used in this table, see the abbreviation and acronym list that precedes the Index.

Table 2-1. System Messages *(continued)*

Message	Cause	Action
`Warning - Thermal Probes failed.`	At system start-up, the BIOS has detected that one or both of the thermal probes in the computer are nonoperational.	You can continue to use the system, but be aware that the temperature probe(s) are disabled and a processor overheat condition will not warn the Thermal Shutdown service to shut down the system. *NOTE: The Pentium® Pro microprocessor has a built-in thermocouple that halts microprocessor operation if the microprocessor exceeds its rated temperature.* To correct this problem, you must replace your system board. For technical assistance, see Chapter 7, "Getting Help."
`Warning - Temperature is too high.`	At system start-up, the BIOS has detected that one or both microprocessors are overheated. After displaying this message, the BIOS halts the processes and turns off the system.	Let the system cool down before attempting to restart it.
`Write fault` `Write fault on selected drive`	The operating system cannot write to the diskette or hard-disk drive.	See "Troubleshooting the Diskette/Tape Drive Subsystem" in Chapter 6.

NOTE: For the full name of an abbreviation or acronym used in this table, see the abbreviation and acronym list that precedes the Index.

System Beep Codes

When errors occur during a boot routine that cannot be reported on the monitor, your computer may emit a series of beeps that identify the problem. The beep code is a pattern of sounds: for example, one beep, followed by a second beep, and then a burst of three beeps (code 1-1-3) means that the computer was unable to read the data in nonvolatile random-access memory (NVRAM). This information is invaluable to the Dell support staff if you need to call for technical assistance.

When a beep code is emitted, write it down on a copy of the Diagnostics Checklist found in Chapter 7, “Getting Help,” and then look it up in Table 2-2. If you are unable to resolve the problem by looking up the meaning of the beep code, use the Dell Diagnostics to identify a more serious cause. If you are still unable to resolve the problem, see Chapter 7, “Getting Help,” for instructions on obtaining technical assistance.

Table 2-2. System Beep Codes

Code	Cause	Action
1-1-2	Microprocessor register failure	See Chapter 7, “Getting Help,” for instructions on obtaining technical assistance.
1-1-3	NVRAM	Run the System Set Test Group in the Dell Diagnostics. See Chapter 4, “Running the Dell Diagnostics.”
1-1-4	ROM BIOS checksum failure	Run the System Set Test Group in the Dell Diagnostics, if possible. See Chapter 4, “Running the Dell Diagnostics.”
1-2-1	Programmable interval timer	Run the System Set Test Group in the Dell Diagnostics, if possible. See Chapter 4, “Running the Dell Diagnostics.”
1-2-2	DMA initialization failure	Run the System Set Test Group in the Dell Diagnostics, if possible. See Chapter 4, “Running the Dell Diagnostics.”
1-2-3	DMA page register read/ write failure	Run the System Set Test Group in the Dell Diagnostics, if possible. See Chapter 4, “Running the Dell Diagnostics.”
1-3	Video Memory Test failure	Run the Video Test Group in the Dell Diagnostics. See Chapter 4, “Running the Dell Diagnostics.”
1-3-1 through 2-4-4	SIMMs or DIMMs not being properly identified or used	See “Troubleshooting System Memory” in Chapter 7.
3-1-1	Slave DMA register failure	Run the System Set Test Group in the Dell Diagnostics, if possible. See Chapter 4, “Running the Dell Diagnostics.”
3-1-2	Master DMA register failure	Run the System Set Test Group in the Dell Diagnostics, if possible. See Chapter 4, “Running the Dell Diagnostics.”
3-1-3	Master interrupt mask register failure	Otherwise, see Chapter 7, “Getting Help,” for instructions on obtaining technical assistance.
3-1-4	Slave interrupt mask register failure	Otherwise, see Chapter 7, “Getting Help,” for instructions on obtaining technical assistance.
3-2-2	Interrupt vector loading failure	See Chapter 7, “Getting Help,” for instructions on obtaining technical assistance.

NOTE: For the full name of an abbreviation or acronym used in this table, see the abbreviation and acronym list that precedes the Index.

Table 2-2. System Beep Codes *(continued)*

Code	Cause	Action
3-2-4	Keyboard Controller Test failure	Run the Keyboard Test Group in the Dell Diagnostics. See Chapter 4, “Running the Dell Diagnostics.” Otherwise, see Chapter 7, “Getting Help,” for instructions on obtaining technical assistance.
3-3-1	NVRAM power loss	Run the System Set Test Group in the Dell Diagnostics, if possible. See Chapter 4, “Running the Dell Diagnostics.”
3-3-2	NVRAM configuration	Run the System Set Test Group in the Dell Diagnostics, if possible. See Chapter 4, “Running the Dell Diagnostics.”
3-3-4	Video Memory Test failure	Run the Video Test Group in the Dell Diagnostics. See Chapter 4, “Running the Dell Diagnostics.”
3-4-1	Screen initialization failure	Run the Video Test Group in the Dell Diagnostics. See Chapter 4, “Running the Dell Diagnostics.”
3-4-2	Screen retrace failure	Run the Video Test Group in the Dell Diagnostics. See Chapter 4, “Running the Dell Diagnostics.”
3-4-3	Search for video ROM failure	Run the Video Test Group in the Dell Diagnostics. See Chapter 4, “Running the Dell Diagnostics.”
4-2-1	No time tick	Otherwise, see Chapter 7, “Getting Help,” for instructions on obtaining technical assistance.
4-2-2	Shutdown failure	See Chapter 7, “Getting Help,” for instructions on obtaining technical assistance.
4-2-3	Gate A20 failure	See Chapter 7, “Getting Help,” for instructions on obtaining technical assistance.
4-2-4	Unexpected interrupt in protected mode	Otherwise, see Chapter 7, “Getting Help,” for instructions on obtaining technical assistance.
4-3-1	Memory failure above address 0FFFFh	Run the RAM Test Group in the Dell Diagnostics. See Chapter 4, “Running the Dell Diagnostics.”
4-3-3	Timer-chip counter 2 failure	Otherwise, see Chapter 7, “Getting Help,” for instructions on obtaining technical assistance.
4-3-4	Time-of-day clock stopped	Otherwise, see Chapter 7, “Getting Help,” for instructions on obtaining technical assistance.
4-4-1	Serial or parallel port test failure	Run the Serial/Infrared Port Test Group and the Parallel Port Test Group in the Dell Diagnostics. See Chapter 4, “Running the Dell Diagnostics.”

NOTE: For the full name of an abbreviation or acronym used in this table, see the abbreviation and acronym list that precedes the Index.

Table 2-2. System Beep Codes (continued)

Code	Cause	Action
4-4-2	Failure to decompress code to shadowed memory.	Run the System Set Test Group in the Dell Diagnostics. See Chapter 4, "Running the Dell Diagnostics."
4-4-3	Math-coprocessor test failure	Run the System Set Test Group in the Dell Diagnostics. See Chapter 4, "Running the Dell Diagnostics."
4-4-4	Cache test failure	Run the System Set Test Group in the Dell Diagnostics. See Chapter 4, "Running the Dell Diagnostics."
5-1-2	BIOS update error—no RAM in system	See "Troubleshooting System Memory" in Chapter 6.
5-1-3	BIOS update error—external video card detected	If a video expansion card is installed, disconnect the video expansion card and connect the monitor to the built-in video subsystem. If the problem is not resolved, see "Troubleshooting the Video Subsystem" in Chapter 6.
5-1-4	BIOS execution error	Run the System Set Test Group in the Dell Diagnostics. See Chapter 4, "Running the Dell Diagnostics."
6-1-2	I/O controller failure	Run the System Set Test Group in the Dell Diagnostics. See Chapter 4, "Running the Dell Diagnostics."
6-1-3	Keyboard controller failure	Run the System Set Test Group in the Dell Diagnostics. See Chapter 4, "Running the Dell Diagnostics."
6-1-4	CMOS Register Test failure	Run the System Set Test Group in the Dell Diagnostics. See Chapter 4, "Running the Dell Diagnostics."
6-2-1	BIOS shadowing failure	Run the System Set Test Group in the Dell Diagnostics. See Chapter 4, "Running the Dell Diagnostics."
6-2-2	Pentium speed determination failure	Run the System Set Test Group in the Dell Diagnostics. See Chapter 4, "Running the Dell Diagnostics."
6-2-3	No SIMM or DIMM installed	See "Troubleshooting System Memory" in Chapter 6.

NOTE: For the full name of an abbreviation or acronym used in this table, see the abbreviation and acronym list that precedes the Index.

Warning Messages

A warning message alerts you to a possible problem and asks you to do something before execution continues. For example, before you format a diskette, a message may warn you that you may lose all data on the diskette as a way to protect against inadvertently erasing or writing over the data. These warning messages usually interrupt the procedure and require you to respond by typing a `y` (yes) or `n` (no).

NOTE: Warning messages are generated by either your application programs or your operating system. See Chapter 3, "Finding Software Solutions," and the documentation that accompanied your operating system and application programs.

Diagnostics Messages

When you run a test group or subtest in the Dell Diagnostics, an error message may result. These particular error messages are not covered in this chapter. Record the message on a copy of your Diagnostics Checklist found in Chapter 7, "Getting Help." Also see Chapter 7 for instructions on obtaining technical assistance.

Chapter 3
Finding Software Solutions

Because most computers have several application programs installed in addition to the operating system, isolating a software problem can be confusing. Software errors can also appear to be hardware malfunctions at first. Software problems can result from the following circumstances:

- Improper installation or configuration of a program
- Input errors
- Device drivers that may conflict with certain application programs
- Memory conflicts resulting from the use of terminate-and-stay-resident (TSR) programs
- Interrupt conflicts between devices

You can confirm that a computer problem is caused by software by running the System Set Test Group as described in Chapter 4, "Running the Dell Diagnostics." If all tests in the test group complete successfully, the error condition is most likely caused by software.

This chapter provides some general guidelines for analyzing software problems. For detailed troubleshooting information on a particular program, see the documentation that accompanied the software or consult the support service for the software.

Installing and Configuring Software

When you obtain software, check it for viruses with virus-scanning software before installing it on your computer's hard-disk drive. Viruses, which are pieces of code that can replicate themselves, can quickly use all available system memory, damage and/or destroy data stored on the hard-disk drive, and permanently affect the performance of the programs they infect. Several commercial virus-scanning programs are available for purchase, and most bulletin board services (BBSs) archive freely distributed virus-scanning programs that you can download with a modem.

Before installing a program, read its documentation to learn how the program works, what hardware it requires, and what its defaults are. A program usually includes installation instructions in its accompanying documentation and a software installation routine on its program diskettes.

The software installation routine assists you in transferring the appropriate program files to your computer's hard-disk drive. Installation instructions may provide details about how to configure your operating system to successfully run the program. Always read the installation instructions before running a program's installation routine. You may be instructed to modify some operating system start-up files, such as **config.sys** and **autoexec.bat**, or the installation routine may modify start-up files automatically.

When you run the installation routine, be prepared to respond to prompts for information about how your computer's operating system is configured, what type of computer you have, and what peripherals are connected to your computer.

Expanded and Extended Memory

Depending on which Dell computer you have, the system memory can be expanded by installing additional single in-line memory modules (SIMMs) or dual in-line memory modules (DIMMs) or by exchanging installed SIMMs or DIMMs for ones of larger capacity. If you operate your computer with MS-DOS, the operating system makes only 640 kilobytes (KB) (called *conventional memory*) of the first 1 megabyte (MB) of system memory

available for use by application programs. Some programs require more than 640 KB of memory and, therefore, cannot be run with conventional memory alone. Other programs run much faster when they have more than 1 MB of memory to use.

When you boot your computer, MS-DOS recognizes memory in excess of 1 MB as *extended memory.* Some, but not all, programs are able to use extended memory. For example, the Microsoft Windows 3.*x* operating system and Lotus® 1-2-3 take advantage of extended memory.

Other programs are able to use extended memory only if it is first converted into *expanded memory* by an expanded memory manager (EMM).

NOTE: Not all Dell computers have an EMM driver. See your system documentation to determine whether an EMM driver is provided with your system.

Under the following conditions, expanded memory can greatly enhance the system's ability to use application programs that require more memory than is available in the conventional memory area:

- The application program is written for use with expanded memory.
- The memory has been properly allocated using the System Setup program. (See your system documentation for more information on the System Setup program.)
- The EMM driver is installed and properly initialized.

Improper use of an EMM can lead to conflicts between the expanded-memory operation and any installed expansion cards, which may be assigned memory areas that overlap memory areas that the EMM is using. For more information about these types of conflicts and how to avoid them, see "Checking for Memory Address Conflicts" found later in this chapter.

Using Software

The following subsections discuss errors that can occur as a result of software operation or configuration.

Error Messages

Error messages can be produced by an application program, the operating system, or the computer. Chapter 2, "Messages and Codes," discusses the error messages that are generated by the system. If you receive an error message that is not listed in Chapter 2, check your operating system or application program documentation.

Input Errors

If a specific key or set of keys is pressed at the wrong time, a program may give you unexpected results. See the documentation that came with your application program to make sure the values or characters you are entering are valid.

Make sure the operating environment is set up to accommodate the programs you use. Keep in mind that whenever you change the parameters of the computer's operating environment, you may affect the successful operation of your programs. Sometimes, after modifying the operating environment, you may need to reinstall a program that no longer runs properly.

Memory-Resident Programs

There are a variety of utilities and supplementary programs that can be loaded either when the computer boots or from an operating system prompt. These programs are designed to stay resident in system memory and thus always be available for use. Because they remain in the computer's memory, memory conflicts and errors can result when other programs require use of all or part of the memory already occupied by these TSR programs.

Typically, your operating system's start-up files (such as **config.sys** and **autoexec.bat**) contain commands to start TSR programs when you boot your system. If you suspect that one of these TSR programs is causing a memory conflict, remove the commands that start them from the start-up file. If the problem you were experiencing does not recur, one of the TSR programs probably created the conflict. Add the TSR commands back into the start-up files one at a time until you identify which TSR program is creating the conflict.

Program Conflicts

Some programs may leave portions of their setup information behind, even though you have exited from them. As a result, other programs cannot run. Rebooting your system can confirm whether or not these programs are the cause of the problem.

There are also programs that use specialized subroutines called *device drivers* that can also cause problems with your computer system. For example, a variation in the way the data is sent to the monitor may require a special screen driver program that *expects* a certain kind of video mode or monitor. In such cases, you may have to develop an alternative method of running that particular program—the creation of a boot file made especially for that program, for example. Call the support service for the software you are using to help you with this problem.

Checking for Memory Address Conflicts

Memory address conflicts occur when two or more devices try to access the same address in the upper memory block (UMB). For example, if a network expansion card and an expanded-memory page frame are assigned an overlapping block of addresses, a memory address conflict arises. As a result, when you try to log into the network, the operation fails.

To resolve this type of conflict, you can change the address of one of the devices. For example, in the case of the network expansion card and expanded-memory page-frame address conflict, you can move the network card to an address block in the range of CC000h through D0000h. To reassign the expansion card's address block, refer to the documentation for the card.

Avoiding Interrupt Assignment Conflicts

Problems can arise if two devices attempt to use the same interrupt request (IRQ) line. To avoid this type of conflict, check the documentation for the default IRQ line setting for each installed expansion card. Then consult Table 3-1 to configure the card for one of the available IRQ lines.

NOTE: Table 3-1 lists default IRQ settings. In systems with Plug and Play capabilities, the default settings can be modified. If you are installing a Plug and Play card in a Plug and Play system, the system will automatically select an open IRQ line if any are available. If you are installing a non-Plug and Play or legacy card, run the ISA Configuration Utility provided with your system to determine the current IRQ settings and to find an available IRQ line. For instructions, see the ISA Configuration Utility chapter in your system documentation.

Table 3-1. Default IRQ Line Assignments

IRQ Line	Used/Available
IRQ0	Used by the system timer
IRQ1	Used by the keyboard to signal that the output buffer is full
IRQ2	Used by interrupt controller 1 to enable IRQ8 through IRQ15
IRQ3	Used by serial port 2
IRQ4	Used by serial port 1
IRQ5	Available
IRQ6	Used by the diskette/tape drive controller
IRQ7	Used by the parallel port
IRQ8	Used by the RTC
IRQ9	Used by the VGA interface (optional)
IRQ10	Available
IRQ11	Available
IRQ12	Used by the mouse port
IRQ13	Used by the math coprocessor (if applicable)
IRQ14	Used by the primary IDE controller
IRQ15	Used by the secondary IDE controller

NOTE: For the full name of an abbreviation or acronym used in this table, see the abbreviation and acronym list that precedes the Index.

Chapter 4
Running the Dell Diagnostics

Unlike many diagnostic programs, the Dell Diagnostics helps you check your computer's hardware without any additional equipment and without destroying any data. By using the diagnostics, you can have confidence in your computer system's operation. And if you find a problem you cannot solve by yourself, the diagnostic tests can provide you with important information you will need when talking to Dell's service and support personnel.

CAUTION: Use the Dell Diagnostics to test *only* your Dell computer system. Using this program with other computers may cause incorrect computer responses or result in error messages.

Features of the Dell Diagnostics

The Dell Diagnostics provides a series of menus and options from which you choose particular test groups or subtests. You can also control the sequence in which the tests are run. The diagnostic test groups or subtests also have these helpful features:

- Options that let you run tests individually or collectively
- An option that allows you to choose the number of times a test group or subtest is repeated
- The ability to display or print out test results, or to save them in a file
- Options to temporarily suspend testing if an error is detected, or to terminate testing when an adjustable error limit is reached
- A menu category called About that briefly describes each test and its parameters
- Status messages that inform you whether test groups or subtests were completed successfully
- Error messages that appear if any problems are detected

When to Use the Dell Diagnostics

Whenever a major component or device in your computer system does not function properly, you may have a component failure. As long as the microprocessor and the input and output components of your computer system (the monitor, keyboard, and diskette drive) are working, you can use the Dell Diagnostics. If you are experienced with computers and know what component(s) you need to test, simply select the appropriate diagnostic test group(s) or subtest(s). If you are unsure about how to begin diagnosing a problem, read the rest of this chapter.

Before You Start Testing

Follow these steps to create a master and/or working copy of the *Dell Diagnostics Diskette.*

1. **If you received a *Dell Diagnostics Diskette* with your Dell system, go to step 4.**

2. **If you did not receive a *Dell Diagnostics Diskette*, a diskette image has been installed on your computer's hard-disk drive so that you can make your own copy of the diskette.**

   *If Dell installed the Microsoft Windows 3.*x *or Windows 95 operating system on your computer's hard-disk drive,* see the online help in Dell's Program Diskette Maker utility, which is available in the Dell Accessories group or folder, for instructions on making a program diskette set from the diskette image.

   If Dell installed MS-DOS, but not Windows, on your computer's hard-disk drive, see the Dell Menu, which appears when you first turn on your system, for instructions on making a program diskette set from the diskette image.

3. **Using a felt-tip pen, write "Dell Diagnostics Diskette" on the diskette label.**

4. **Make a working copy of the *Dell Diagnostics Diskette* on a blank diskette.**

   Refer to your operating system's documentation for information on how to duplicate diskettes. Put the original diskette away for safekeeping.

5. **Turn on your printer if one is attached, and make sure it is online.**

6. **Enter the System Setup program, confirm your computer's system configuration information, and enable all its components and devices, such as ports.**

   For instructions on entering and using the System Setup program, see your system documentation.

Starting the Dell Diagnostics

After you complete the preliminary instructions specified in the previous section, follow these steps to start the diagnostics:

1. **Turn off the computer.**

2. **Place your diagnostics diskette in drive A, and boot the system.**

NOTE: Before you read the rest of this chapter, you may want to start the Dell Diagnostics so that you can see it on the screen of your monitor.

When you start the diagnostics, the Dell logo screen appears, followed by a message telling you that the diagnostics is loading.

After the diagnostics loads, the Diagnostics Menu appears. The menu allows you to run all or specific diagnostic tests or to exit to the MS-DOS prompt.

For a quick check of your system, select the Run Quick Tests option. This option runs only the subtests that do not require user interaction and that do not take a long time to run. Dell recommends that you choose this option first to increase the odds of tracing the source of the problem quickly. For a thorough check of your system, select the Run All Tests option. To check a particular area of your system, select the Run Specific Tests option.

To select an option from this menu, highlight the option and press <Enter>, or press the key that corresponds to the highlighted letter in the option you choose.

```
Dell Computer Corporation
Dell System Diagnostics Version X.XX

Diagnostics Menu

Run All Tests
RUn Quick Tests
RuN Specific Tests
Exit To MS-DOS
```

Figure 4-1. Diagnostics Menu

How to Use the Dell Diagnostics

When you select Run Specific Tests from the Diagnostics Menu, the main screen of the diagnostics appears (see Figure 4-2). The main screen lists the diagnostic test groups, gives information about the configuration of your computer system, and allows you to select categories from a menu. From this screen, you can enter two other types of screens.

Information on the main screen of the diagnostics is presented in the following five areas:

- Two lines at the top of the screen identify the version number of the Dell Diagnostics.
- On the left side of the screen, the Available Test Group area lists the diagnostic test groups in the order they will run if you select All from the Run menu category. Press the up- or down-arrow key to highlight a test group.
- On the right side of the screen, the System Configuration area lists the computer's currently detected hardware and some of the relevant settings.
- The lower-right side of the screen displays information about your integrated drive electronics (IDE) hard-disk and CD-ROM drive(s).
- Two lines at the bottom of the screen make up the menu area. The first line lists the categories you can select; press the left- or right-arrow key to highlight a menu category. The second line gives information about the category currently highlighted.

```
                    Dell Computer Corporation
             Dell System Diagnostics Version X.XX

      Available Test Groups             System Configuration

 RAM                                Memory                        4 MB
 System Set                         Secondary Cache             128 KB
 Video                              Processor(s)               Pentium
 Keyboard                           Video                   SVGA,1024K
 Mouse                              Keyboard                   101 Key
 Diskette Drives                    Mouse                PS/2 2-button
 Hard-Disk Drives (Non-SCSI)        Diskette Drive(s)          A:1.4MB
 IDE CD ROM Drives                  IDE(0)524MB, 1016 Cyl, 16 Hd, 63 Sec
 Serial/Infrared Ports              IDE(2) CDROM:   NEC CD-ROM DRIVE:260
 Parallel Ports                     Serial/IR Port(s)                2
 SCSI Devices                       Parallel Port(s)                 1
 Network Interface                  Modems                        None
 Audio                              SCSI Devices                     2
 Other                              Network Interface             None
                                    Serial/IR Ports         Integrated
                                    Audio                         None
                                    Embedded Server Management

Main Menu: Run  seLect  Subtest  Options  Test_limits  About  Key_help  Quit
Display the Run Menu.                                       Press Q to Quit
```

NOTE: The options displayed on your screen should reflect the hardware configuration of your computer system.

Figure 4-2. Dell Diagnostics Screen

Confirming the System Configuration Information

When you boot your system from your diagnostics diskette, the diagnostics checks your system configuration information and displays it in the System Configuration area on the main screen.

The following sources supply this configuration information for the diagnostics:

- The system configuration information settings (stored in nonvolatile random-access memory [NVRAM]) that you selected while using the System Setup program
- Identification tests of the microprocessor, the video controller, the keyboard controller, and other key components
- Basic input/output system (BIOS) configuration information temporarily saved in RAM

Do not be concerned if the System Configuration area does not list the names of all the components or devices you know are part of your computer system. For example, you may not see a printer listed, although you know one is attached to your computer. Instead, the printer is listed as a parallel port. The computer recognizes the parallel port as LPT1, which is an address that tells the computer where to send outgoing information and where to look for incoming information. Because

your printer is a parallel communications device, the computer recognizes the printer by its LPT1 address and identifies it as a parallel port.

How to Use the Menu

One of the menu categories is already highlighted. You can move the highlight from one category to another by pressing the left- or right-arrow key. As you move from one menu category to another, a brief explanation of the currently highlighted category appears on the bottom line of the screen.

If you want more information about a test group or subtest, move the highlight to the About category and press <Enter>. After reading the information, press the <Esc> key to return to the previous screen.

Main Menu Categories

Eight categories are listed in the Main menu of the diagnostics main screen: Run, Select, Subtest, Options, Test Limits, About, Key-Help, and Quit.

NOTE: Before running any test groups or subtests (by selecting Run), you should consider setting global parameters within the Options category. They offer you greater control over how the test groups or subtests are run and how their results are reported.

There are two ways to select a menu category:

- Look on the screen to see which letter in the category is capitalized, and type that letter (for example, type `r` to select the Run category).
- Move the highlight to the category you wish to select by pressing the left- or right-arrow key, and then press <Enter>.

Whenever one of the eight categories is selected, additional choices become available.

The following subsections explain the menu categories as listed from left to right in the Main menu.

Run

Run displays five categories: One, Selected, All, Key-Help, and Quit Menu. If you select One, all the subtests within the highlighted test group are run. If you choose Selected, only the selected test groups or the subtests that you selected within the test groups are run. If you select All, all of the subtests in all of the test groups are run. (The test groups or subtests are run in the same order as they are listed.)

The Key-Help category displays a list of key controls available for the particular category you have chosen.

The Quit Menu category returns you to the Main menu.

Select

Select allows you to select individual test groups to tailor the testing process to your particular needs. You can choose one or more test groups and run them sequentially or individually. When you choose Select, five categories are displayed: All, One, Clear All, Key-Help, and Quit Menu.

To select all the test groups, press the <Enter> key when All is highlighted in the Select menu.

To select an individual test group, highlight the test group and press the <Spacebar> or highlight One and press <Enter>. Press the up- or down-arrow key to change the highlighted test group.

To reverse a test group selection, highlight the test group and press the <Spacebar>. To clear all selections, select Clear All.

The Key-Help category displays a list of key controls available for the particular category you have chosen. The Quit Menu category returns you to the Main menu.

Subtest

Most of the test groups consist of several subtests. Use the Subtest category to select individual subtests within the test group(s).

When you select Subtest, many of the same categories as those on the Main menu are displayed: Run, Select, Options, Test Limits, About, Key-Help, and Quit Menu. Each of these categories is explained in the following subsections.

Run Under Subtest

Run in the Subtest menu displays five categories: One, Selected, All, Key-Help, and Quit Menu. If you select One, only the highlighted subtest is run. If you select Selected, only the selected subtests are run. If you select All, all of the subtests listed on the screen are run. (The subtests are run in the same order as they are listed.)

The Key-Help category displays a list of key controls available. The Quit Menu category returns you to the previous menu.

Select Under Subtest

Select in the Subtest menu allows you to select individual subtests to tailor the testing process to your particular needs. You can choose one or more subtests from the list. When you choose Select, five categories are displayed: All, One, Clear All, Key-Help, and Quit Menu.

To select all the subtests, press the <Enter> key when All is highlighted in the Select menu. To select an individual subtest, highlight the subtest and press the <Spacebar> or highlight One and press <Enter>. Press the up- or down-arrow key to highlight a subtest to be selected.

To reverse a subtest selection, highlight the subtest and press the <Spacebar>. To clear all selections, select Clear All.

The Key-Help category displays a list of key controls available. The Quit Menu category returns you to the previous menu.

Options Under Subtest

The Options category in the Subtest menu functions the same way as the Options category in the Main menu. For information on this category, see "Options" found later in this chapter.

Test Limits Under Subtest

The Test Limits category in the Subtest menu functions the same way as the Test Limits category in the Main menu. For information on this category, see "Test Limits" found later in this chapter.

About Under Subtest

The About category in the Subtest menu displays information about the highlighted subtest.

Key-Help Under Subtest

The Key-Help category in the Subtest menu displays a list of key controls available.

Quit Menu Under Subtest

The Quit Menu category in the Subtest menu returns you to the Main menu.

Options

Table 4-1 lists all of the possible values for each global parameter of Options. A brief description of each parameter follows the table. To change Options parameters, press the <Spacebar>, the left- and right- arrow keys, or the plus (+) and minus (-) keys.

Number of Times to Repeat Test(s)

This parameter specifies the number of times the tests run when you select Run. To change the default, type in the desired value. If you type 0 (zero), the tests will run indefinitely.

Maximum Errors Allowed

This parameter specifies the maximum number of errors that can occur before testing is stopped. The error count begins from zero each time you run a subtest or test group individually or each time you select All to run all of them. To change the default, type in the desired value.

If you type 0 (zero), you are specifying that there be no limit on the number of errors that can occur—testing will not be stopped, regardless of the number of errors.

Table 4-1. Option Parameters

Option Limit	**Possible Values**
Number of Times to Repeat Test(s)	0001 through 9999, or 0000, which loops indefinitely until you press the <Ctrl> and <Break> keys. The default is 1.
Maximum Errors Allowed	0000 through 9999, where 0000 means that there is no error limit. The default is 1.
Pause For User Response	Yes, No Allows you to decide whether tests will wait for user input. The default is Yes to wait for user input.
Output Device for Status Messages	Display, Printer, File If you have a printer attached to your computer, you can use it to print the *status* messages, if any, that are generated when a test runs. (The printer must be turned on and in the online mode to print.) If you select File, the messages are printed to a file named **result** on a diskette that you insert into drive A when prompted. If you are running the diagnostics from a utility partition on your hard-disk drive, the **result** file is created on the hard-disk drive. The default is Display.
Output Device for Error Messages	Display, Printer, File This parameter has the same effect as the Output Device for Status Messages parameter, except that it pertains only to error messages. The default is Display.

Pause for User Response

If this parameter value is set to Yes, the diagnostics pauses when one of the following occurs:

- Your interaction is needed to verify the Video Test Group screens or the Keyboard Test Group key functions or other types of interaction such as inserting a diskette.
- The maximum error limit is reached.

If the Pause parameter is set to No, the diagnostics ignores some subtests that require your interaction; certain subtests can run only if this option is set to Yes because they require user interaction. Use the Pause parameter in situations where you may want to prevent subtests that require user interaction from running—such as when you run the diagnostics overnight.

Output Device for Status Messages

Ordinarily, all status messages appear only on the screen. This parameter allows you to direct status messages to either a printer or a file, in addition to the screen. If you choose the File option, status messages are written to a file named **result**. This file is automatically created on a diskette that you insert into drive A when prompted. If you are running the diagnostics from a utility partition on your hard-disk drive, the **result** file is created on the hard-disk drive. If the **result** file already exists, new status messages are added to it.

The **result** file is an ordinary American Standard Code for Information Interchange (ASCII) text file that you can open in any text viewer or word processor. You can also access the **result** file with the MS-DOS **type** command as follows:

1. **Select Quit to exit the diagnostics and return to the operating system prompt.**
2. **At the operating system prompt, type the appropriate command and press <Enter>:**

   `type result`

   The contents of the file appear on the screen.

After running particular diagnostic tests and viewing the status messages generated by the tests in the **result** file, you can erase the contents of the file so that it is clear for the next set of messages generated. Otherwise, the next messages are added at the end of the previous ones in the file.

Output Device for Error Messages

Ordinarily, all error messages appear only on the screen. This parameter allows you to direct error messages to either a printer or a file, in addition to the screen. If you choose the File option, error messages are written to the **result** file used for status messages. This file is automatically created on a diskette that you insert into drive A when prompted. If you are running the diagnostics from a utility partition on your hard-disk drive, the **result** file is created on the hard-disk drive. If the **result** file already exists, new error messages are added to it.

The **result** file is an ordinary ASCII text file. You can access and review the **result** file as described in the previous subsection, "Output Device for Status Messages."

After running particular diagnostic tests and viewing the error messages generated by the tests in the **result** file, you can erase the contents of the file so that it is clear for the next set of messages generated. Otherwise, the next messages are added at the end of the previous ones in the file.

Test Limits

NOTE: The Dell Diagnostics sets default limits on all tests. The only reason to change the default would be to limit the amount of testing done.

The RAM Test Group, the Video Test Group, the Diskette Drives Test Group, the Hard-Disk Drives (Non-SCSI) Test Group, the Serial/Infrared Ports Test Group, the Parallel Ports Test Group, and the SCSI Devices Test Group allow you to designate limits. Whether you select Test Limits for a highlighted test group (from the Main menu) or a subtest (from the Subtest menu), you set the limits for all the subtests in that test group. When you select Test Limits, a new screen appears and the Key-Help area lists keys to use with the new screen. Press <Page Down> to select the next menu or submenu. Press <Esc> to return to the main Test Limits window.

How you change a value for the limits of a test group or subtest depends on the type of parameter associated with it. Different keys are used to change values for different types of parameters. For example, memory address limits specified for the RAM Test Group are changed by typing in numbers over the digits of a given limit or by pressing the plus (+) or minus (-) keys to increase or decrease the given limit. In contrast, to set limits for the Serial/Infrared Ports Test Group, you use the <Spacebar> to toggle between Yes and No.

After you are satisfied with the limits, return to the Dell Diagnostics main screen by pressing the <Esc> key. The values you selected under Test Limits remain in effect during all the test groups or subtests you run, unless you change them. However, the values are reset to their defaults when you restart the diagnostics.

About

About in the Main menu lists all of the subtests for the selected test group and displays information about the subtest that is highlighted.

Key-Help

Key-Help always displays a list of key controls available for the particular category you have selected.

Quit

Selecting Quit from the Main menu exits the diagnostics and returns you to your operating system environment.

After you return to the operating system environment, remove your diagnostics diskette from drive A and reboot the computer.

CAUTION: It is important that you quit the diagnostics correctly because the program writes data to the computer's memory that can cause problems unless properly cleared.

Tests in the Dell Diagnostics

To troubleshoot components or devices, run the appropriate test (test group or subtest) in the diagnostics on your diagnostics diskette. The diagnostics exercises the functional components and devices of your computer system more vigorously and thoroughly than they are exercised during normal operation. The diagnostics is organized by components into test groups and subtests within each test group. Each subtest is designed to detect any errors that may interfere with the normal operation of a specific device of the computer.

NOTE: Some subtests requiring hardware not listed in the System Configuration area of the diagnostics screen appear to run, but they conclude with a status message stating `Component not present (or disabled).`

Table 4-2 lists the diagnostic test groups, their subtests, and comments concerning their use.

Table 4-2. Dell Diagnostics Tests

Test Groups	Subtests	Description
RAM	Quick Memory Test Comprehensive Memory Test Secondary Cache Memory Test	Tests the RAM and cache. (Some computers include expanded or extended memory; all memory is tested.)
System Set	CMOS Confidence Test CMEM Confidence Test DMA Controller Test Real-Time Clock Test System Timers Test Interrupt Controller Test Reset Button Test System Speaker Test	Tests the system board's support chips, DMA controller, computer timer, NVRAM, speaker controller, cache, and EISA configuration RAM chip, as appropriate.
	Coprocessor Calculation Test Coprocessor Error Exception Test	Tests the math coprocessor that is internal to the microprocessor.
	PC Card Controller Test	Tests the PC Card controller on the system board.
	Thermal Control Test	Checks the functionality of the thermal-monitoring and microprocessor speed-switching device on the system board.
	Multiprocessor Test	For systems with multiprocessors, confirms that the secondary microprocessor is operational.
	USB Register Test	Checks the onboard registers of the USB interface. This subtest does not test USB peripherals.
	USB Memory Structure Test	Monitors the ability of a USB controller to process a simple set of memory-resident instructions.

NOTES: Not all of these tests appear for each system.

For the full name of an abbreviation or acronym used in this table, see the abbreviation and acronym list that precedes the Index.

Table 4-2. Dell Diagnostics Tests *(continued)*

Test Groups	Subtests	Description
Video	Video Memory Test Video Hardware Test Text Mode Character Test Text Mode Color Test Text Mode Pages Test Graphics Mode Test Color Palettes Test Solid Colors Test	Tests the video subsystem and monitor by checking various aspects of video output.
Keyboard	Keyboard Controller Test Keyboard Key Sequence Test Keyboard Interactive Test Stuck Key Test External Key Pad Test	Tests the keyboard by checking the keyboard controller and by finding keys that stick or respond incorrectly.
Mouse	Mouse	Tests the electronic pointing device (bus mouse, serial mouse, trackball, or PS/2 mouse).
Diskette Drives	Change Line Test Seek Test Read Test Write Test	Tests a drive that uses removable diskettes (3.5-inch or 5.25-inch). Also tests the associated interface.
Hard-Disk Drives (Non-SCSI)	Disk Controller Test Forced Error-Correction-Code Test Seek Test Read Test Write Test	Tests drives that use fixed, internal disks. Also tests the associated interface.
IDE CD ROM Drives	Drive Controller Test Seek Test Read Test Audio Output Test Eject Removable Media	Tests an IDE drive that uses removable CD media. Also tests the associated interface.
Serial/Infrared Ports	Serial/Infrared Baud Rate Test Serial/Infrared Interrupt Test Serial/Infrared Internal Trans-mission Test Serial External Transmission Test	Tests the components through which peripherals that use the serial or infrared ports, such as printers and communications devices, send and receive data.

NOTES: Not all of these tests appear for each system.

For the full name of an abbreviation or acronym used in this table, see the abbreviation and acronym list that precedes the Index.

Table 4-2. Dell Diagnostics Tests *(continued)*

Test Groups	Subtests	Description
Parallel Ports	Parallel Internal Test Parallel External Loopback Test Parallel External Interrupt Test Parallel Printer Pattern Test	Tests the components through which peripherals that use the parallel port, such as printers and communications devices, send and receive data.
SCSI Devices	Internal Diagnostic Seek Test Read Test Write Test Audio Output Test Eject Removable Media Display Information	Tests any installed SCSI host adapters and all the SCSI devices attached to them. Also can be used to remove CDs and tape cartridges from SCSI devices and to display information about the types of SCSI devices installed and the resources allocated to them.
Network Interface	Registers Test Internal Loopback Test External Loopback Test Shared RAM Test Display Information	Tests the read and write access capability to the NIC registers. Also tests the ability of the NIC to transmit and receive data.
Audio	Software Reset Test Compatibility ID Test Interrupt Test DMA Test FIFO RAM Test Initial Reset Status Test Internal Register Test Dual Channel Test	Tests the operation of the audio chip set.
	FM Sound Playback Test Analog Sound Playback Test Record and Playback Test	Tests the record and playback ability of the internal microphone and speakers.

NOTES: Not all of these tests appear for each system.

For the full name of an abbreviation or acronym used in this table, see the abbreviation and acronym list that precedes the Index.

Error Messages

When you run a test group or subtest in the Dell Diagnostics, error messages may result. These particular error messages are not covered in this chapter because the errors that generate these messages can be resolved only with Dell technical assistance. Record the messages on a copy of the Diagnostics Checklist found in Chapter 7, "Getting Help." For instructions on obtaining technical assistance and for informing the support technician of these messages, also see Chapter 7.

RAM Test Group

The RAM Test Group subtests check all the directly addressable RAM.

The RAM Test program has parameters for the subtests that you can set: Test Limits and Options.

Subtests

Three subtests are available for RAM: the Quick Memory Test, the Comprehensive Memory Test, and the Secondary Cache Memory Test. The Quick Memory Test performs an address check to determine whether the computer is properly setting and clearing individual bits in RAM and whether the RAM read and write operations are affecting more than one memory address location at one time. This subtest checks all available RAM. The Comprehensive Memory Test also performs an address check, as well as the following:

- Data pattern checks, to look for RAM bits that are stuck high or low, short-circuited data lines, and some data pattern problems that are internal to the memory chips
- A parity check that verifies the ability of the memory subsystem to detect errors
- A refresh check, to verify that the dynamic RAM (DRAM) is being recharged properly

The Secondary Cache Memory Test confirms the functionality of the computer's cache controller chip and the cache memory.

Why Run a RAM Test?

Faulty memory can cause a variety of problems that may not, at first glance, appear to be happening in RAM. If your computer is displaying one or more of the following symptoms, run the subtests in the RAM Test Group to verify that the memory is not at fault:

- A program is not running as usual, or a proven piece of software appears to malfunction and you confirm that the software itself is not at fault. (You can confirm that the software is functioning properly by moving it to another computer and running it there.)
- Your computer periodically *locks up* (becomes unusable and must be rebooted), especially at different places and times in different programs.
- You get parity errors (any error message that contains the word *parity*) at any time during operation. These errors are usually accompanied by a reference to an *address*—the location of the portion of memory where the error occurred—which you should record on a copy of the Diagnostics Checklist found in Chapter 7, "Getting Help."

System Set Test Group

The subtests in the System Set Test Group check the computer's basic system board components and verify their related functions.

Subtests

The subtests that constitute the System Set Test Group and the computer functions they confirm follow:

- **CMOS Confidence Test**

  Checks the NVRAM for accessibility and reliability of data storage by performing a data pattern check and verifying the uniqueness of memory addresses.

- **CMEM Confidence Test**

  Verifies the accessibility and reliability of the 8 kilobytes (KB) of RAM on the Extended Industry-Standard Architecture (EISA) Configuration RAM chip, which stores the EISA hardware configuration information. On systems without flash

RAM, performs a data pattern and address uniqueness test.

NOTE: This test applies only to systems with an EISA bus.

- **DMA Controller Test**

  Tests the direct memory access (DMA) controller and verifies the correct operation of its page and channel registers by writing patterns to the registers.

- **Real-Time Clock Test**

  Confirms the functionality and accuracy of the computer's real-time clock (RTC).

- **System Timers Test**

  Checks the timers used by the microprocessor for event counting, frequency generation, and other functions. Only the functions that can be activated by software are tested.

- **Interrupt Controller Test**

  Generates an interrupt on each interrupt request (IRQ) line to verify that devices using that line can communicate with the microprocessor and that the interrupt controllers send the correct memory addresses to the microprocessor.

- **Reset Button Test**

  Confirms that the reset button works.

- **System Speaker Test**

  Checks the functionality of the speaker by generating eight tones.

- **Coprocessor Calculation Test**

  Checks the use of different types of numbers and the math coprocessor's ability to calculate correctly.

- **Coprocessor Error Exception Test**

  Verifies the math coprocessor's ability to handle errors and to send IRQs to the microprocessor.

- **PC Card Controller Test**

  Tests the functionality of the PC Card controller on the system board.

- **Thermal Control Test**

  Checks the functionality of the thermal-monitoring and microprocessor speed-switching device on the system board.

- **Multiprocessor Test**

  For systems with multiprocessors, confirms that the secondary microprocessor is operational.

- **USB Register Test**

  Checks the onboard registers of the universal serial bus (USB) interface. This subtest does not test USB peripherals.

- **USB Memory Structure Test**

  Monitors the ability of a USB controller to process a simple set of memory-resident instructions.

Why Run a System Set Test?

The System Set subtests double-check many system board components, such as the computer's input/output (I/O) circuitry, that are tested by other test groups or subtests in the diagnostics. You should run the System Set Test Group if you are having a problem and cannot isolate the failure or malfunction to a particular system board component.

The System Set Test Group also verifies the proper operation of other computer components, such as the speaker, that are not tested elsewhere in the Dell Diagnostics.

The following symptoms usually suggest a problem with a component or subassembly that warrants running a System Set subtest:

- A program is not running as usual, or a proven piece of software appears to malfunction and you confirm that the software itself is not at fault. (You can confirm that the software is functioning properly by moving it to another computer and running it there.)
- An option card you previously accessed can no longer be accessed.
- You get parity errors or page fault failures (any error message that contains the word *parity* or *page fault*) at any time during operation. These errors are usually accompanied by a reference to an address, which you should record on a copy of the Diagnostics Checklist found in Chapter 7, "Getting Help."

- Correcting errors in the system configuration information in the System Setup program does not resolve a problem.
- The computer's clock/calendar stops.
- The speaker no longer functions. The problem could be a failure of the system timers as well as a failure of the speaker itself. Run the System Timers Test, followed by the System Speaker Test.
- If a peripheral device appears to malfunction, run the Interrupt Controllers Test.
- A spreadsheet program or other type of mathematical application runs abnormally slow, generates error messages concerning calculations or operations, runs incorrectly, or generates incorrect results, or a proven piece of the program appears to malfunction and you confirm that the software itself is not at fault. (You can confirm that the software is not at fault by moving the program to another computer and running it there.)
- The computer periodically locks up, especially at different places and times in different programs.
- The computer halts in the middle of performing calculations or complex mathematical operations.

Video Test Group

The subtests in the Video Test Group verify the proper operation of the video controller and the video control circuitry installed in your computer. These subtests check for the correct operation of the readable registers in the video circuitry and the controller. They write, read, and verify data patterns in the cursor registers of the controller. The Video Test Group also tests all the video memory and provides additional subtests to test the color features of a color monitor.

Subtests

The eight subtests in the Video Test Group confirm the following video functions:

- **Video Memory Test**

  Checks the read/write capability of video memory in various video modes.

- **Video Hardware Test**

  Checks the cursor registers and the horizontal and vertical retrace bit registers in the video controller.

- **Text Mode Character Test**

  Checks the video subsystem's ability to present data in text modes.

- **Text Mode Color Test**

  Checks the video subsystem's ability to present color in text modes.

- **Text Mode Pages Test**

  Checks the video subsystem's ability to map and present all available video pages on the screen, one page at a time.

- **Graphics Mode Test**

  Checks the video subsystem's ability to present data and color in graphics modes.

- **Color Palettes Test**

  Checks the video subsystem's ability to display all of the available colors.

- **Solid Colors Test**

  Checks the video subsystem's ability to show screens full of solid colors. Allows you to check for missing color subpixels.

Many of these tests display characters or graphics on the screen for you to verify. Samples of these screens are shown in Appendix A, "Diagnostic Video Tests."

NOTE: The default limit for testing super video graphics array (SVGA) modes is No. If you are testing an external monitor, change the default to Yes.

Why Run a Video Test?

Many of the symptoms that would prompt you to run a subtest in the Video Test Group are obvious, because the monitor is the visual component of your computer system. Before you run the Video Test Group or any of its subtests, you should make sure that the problem is not in your software or caused by a hardware change. You should also try running all of the software support utilities provided for the monitor and the video subsystem.

If the following symptoms still occur, run the appropriate test(s) as follows:

- If your monitor shows a partially formed or distorted image, run *all* of the subtests in the Video Test Group.
- If the alignment of text or images is *off*, regardless of the program you are running, run the Text Mode Character Test, Text Mode Pages Test, and Graphics Mode Test.
- If you have a color monitor or a program that runs in color, but the color is intermittent or not displayed at all, run the Text Mode Color Test, Color Palettes Test, and Solid Color Test.
- If your monitor malfunctions in one mode but works fine in another (for example, text is displayed correctly, but graphics are not), run the Text Mode Character Test, Text Mode Color Test, Text Mode Pages Test, and Graphics Mode Test.

Keyboard Test Group

The subtests in the Keyboard Test Group verify the correct operation of your keyboard and the keyboard controller chip.

Subtests

The five keyboard subtests confirm the following keyboard functions:

- **Keyboard Controller Test**

  Confirms the ability of the keyboard controller chip to communicate with the keyboard and the programming of the controller chip
- **Keyboard Key Sequence Test**

  Verifies that the keys on the keyboard function correctly when you press the keys in a predefined order
- **Keyboard Interactive Test**

  Checks the internal microcode of the keyboard and the external interface of the keyboard controller chip for a malfunctioning key
- **Stuck Key Test**

  Checks the internal microcode of the keyboard and the external interface of the keyboard controller chip for a repeating key signal
- **External Key Pad Test**

  Checks the contact beneath the key for an electrical impulse to ensure that the key is working properly

Why Run a Keyboard Test?

Keyboard problems are not always caused by the keyboard. For example, a complete lockup of the computer system, rendering the keyboard inoperable, is more likely caused elsewhere. There are three symptoms that are likely to be keyboard-related. Sometimes, the configuration of a program changes the function of a key or key combination. Likewise, key configuration programs such as ProKey can change a key's function. Because these programs are memory resident, you should be sure to clear them out of your computer's memory before running a subtest in the Keyboard Test Group. (Clear them from memory by booting your computer from the diagnostics diskette.) When these possibilities have been eliminated, and if the following symptoms occur, you should run one or more of the subtests in the Keyboard Test Group:

- When you press a key, the character represented by that key appears repeatedly; the key seems to be stuck. Run the Stuck Key Test.
- When you press a key and the response is different from the usual response or the response you anticipated, the key contact may be damaged. Run the Keyboard Interactive Test.
- When a key does not work at all, run *all* of the subtests in the Keyboard Test Group.

Mouse Test

The Mouse Test checks the functionality of the mouse controller (which coordinates cursor movement on the screen with corresponding movement of your mouse or touch pad) and the operation of the mouse keys/touch pad.

Subtests

There are no subtests for the Mouse Test Group.

Why Run the Mouse Test?

Mouse or touch pad problems are as likely to originate in RAM as they are to be caused by a faulty mouse or touch pad. Three sources of RAM-related problems include the configuration of a program (which changes the function of the mouse or touch pad), memory-resident programs such as Sidekick or ProKey, and failure of a device driver (the software that controls the function of the mouse or touch pad). If these possibilities have been eliminated and the following symptoms persist, run the Mouse Test:

- When you press a mouse button or the touch pad, the function of the button (or touch pad) continues; that is, the button (or touch pad) seems to be stuck.
- If the response when you press a mouse button or the touch pad is different from the usual or anticipated response, the button (or touch pad) contact may be damaged.
- A mouse button or the touch pad does not work at all.
- The cursor does not respond on the screen in accordance with the movements you make with the mouse or touch pad.

Diskette Drives Test Group

The subtests in the Diskette Drives Test Group allow you to test both 5.25-inch and 3.5-inch diskette drives of all capacities.

Subtests

The four diskette drive subtests available in the Diskette Drives Test Group confirm the following drive functions:

- **Change Line Test**

  Checks for bent pins on the diskette drive controller and for defective lines on the diskette cable

- **Seek Test**

  Checks the drive's ability to search for a specified track on the diskette and to position its read/write heads to all tracks

- **Read Test**

  Positions the read/write heads at each cylinder of the diskette for reading data and verifies that all tracks on the diskette can be read correctly

- **Write Test**

  Positions the read/write heads at each cylinder of the diskette and verifies that all tracks on the diskette can be written to correctly

Why Run a Diskette Drives Test?

Very often, a diskette drive problem may first appear to be a diskette problem. A box of defective diskettes might produce faulty-drive error messages. The test results can be confusing, so Dell suggests running the subtests in the Diskette Drives Test Group more than once using diskettes from different sources.

Another possible cause of diskette drive problems is human error—typing a command in an incorrect form (usually called a *syntax* error). Be sure you have entered the command in the proper form.

When the diskette(s) and command syntax are eliminated as causes, the following symptoms usually suggest a drive problem and warrant running a subtest in the Diskette Drives Test Group:

- An error message appears on the screen stating that the computer cannot *read* from or *write* to a diskette.
- A diskette cannot be properly formatted, or format error messages appear on the screen.
- Data on diskettes is corrupted or lost; these problems may be intermittent.

Hard-Disk Drives (Non-SCSI) Test Group

The subtests in the Hard-Disk Drives (Non-SCSI) Test Group check the functionality of up to four hard-disk drives (two on each channel) of any capacity. The

subtests check the storage capability of a drive as well as the hard-disk drive controller (which affects the ability to read from and write to the drive). The subtests are for all hard-disk drive types except for small computer system interface (SCSI) drives. To test SCSI drives, use the SCSI Devices Test Group.

Subtests

The five subtests in the Hard-Disk Drives (Non-SCSI) Test Group confirm the following drive functions:

- **Disk Controller Test**

  Checks the internal microcode of the hard-disk drive controller

- **Forced Error-Correction-Code Test**

  Checks the ability of the hard-disk drive to identify and correct errors

- **Seek Test**

  Checks the drive's ability to search for a specified track on the drive and to position the read/write heads of the drive to all tracks

- **Read Test**

  Positions the read/write heads at each cylinder of the drive for reading data and verifies that all tracks on the drive can be read correctly

- **Write Test**

  Positions the read/write heads at each cylinder of the drive and verifies that all tracks on the drive can be written to correctly

Why Run a Hard-Disk Drives Test?

If you check your hard-disk drive to determine the amount of available space, your operating system will probably report problem areas. Problem areas on hard-disk drives are common, because most hard-disk drives have a small amount of space that is not usable. The hard-disk drive keeps a record of this space so that your computer will not attempt to use it. Identification of unusable disk space, unless it is an unusually large amount (over five percent of the possible total), should not be regarded as a cause for testing the hard-disk drive.

These are the most common symptoms that might prompt you to test the hard-disk drive:

- The hard-disk drive fails during the boot routine.
- *Seek* errors are reported by the operating system or application programs.
- An error message appears on the screen stating that the computer cannot read from or write to the hard-disk drive.
- Data on the hard-disk drive is corrupted or lost; these problems may be intermittent. Once saved by a program, files cannot be properly recalled.

IDE CD ROM Drives Test Group

The subtests in the IDE CD ROM Drives Test Group check the functionality of up to four IDE CD-ROM drives connected to the primary and secondary IDE ports. Before conducting an IDE CD-ROM test, insert a CD with audio and data tracks (such as a multimedia CD) into each CD-ROM drive.

NOTES: All of the subtests except for the Audio Output Test require a CD with data tracks. The Audio Output Test requires a CD with audio tracks.

If a CD-ROM drive is empty, or if it contains a CD that does not have the required data or audio tracks (depending on the subtest[s] being conducted), the subtest(s) will fail.

Subtests

The five subtests in the IDE CD ROM Drives Test Group confirm the following drive functions:

- **Drive Controller Test**

  Causes the drive to execute its internal self-test.

- **Seek Test**

  Checks the drive's ability to search for each block on the device.

- **Read Test**

  Positions the read heads at each block of the device for reading data and verifies that all blocks on the device can be read correctly.

- **Audio Output Test**

  Causes the drive to begin playing the first audio track on an audio CD. To determine whether the test passed, listen to the audio output of the drive.

  NOTE: To conduct the Audio Output Test, you must select it individually. It will not run as part of the test group.

- **Eject Removable Media**

  Checks the drive's ability to eject its CD.

Why Run an IDE CD ROM Drives Test?

If you encounter a problem while using an application program on a CD, the problem could result from the disc or from the drive. When you encounter problems, first try using a different CD. If the problem recurs, run the IDE CD ROM Drives Test Group.

These are the most common symptoms that might prompt you to test an IDE CD-ROM drive:

- *Seek* errors are reported by the operating system or application programs.
- An error message appears on the screen stating that the computer cannot read from an IDE CD-ROM drive (typically, drive D or drive E).

Serial/Infrared Ports Test Group

The subtests in the Serial/Infrared Ports Test Group check the computer's interface with external devices, such as a printer and a mouse, that are connected to the computer through a serial or infrared port. The subtests in this test group are not intended as a diagnostic test for the actual peripheral attached to each port.

NOTES: With certain modems installed, the Serial/Infrared Ports Test Group subtests may fail because the modem appears to the Dell Diagnostics as a serial or infrared port, but it cannot be tested as a serial or infrared port. If a modem is installed and one of the serial/infrared ports subtests fails, remove the modem and run the diagnostic tests again.

If an external loopback connector is not attached to a serial or infrared port, the Serial External Transmission Test will fail for that port and the results of this test should therefore be ignored. An external modem connected to the port does not substitute for an external loopback connector.

Subtests

The four subtests in the Serial/Infrared Ports Test Group confirm the following port functions:

- **Serial/Infrared Baud Rate Test**

  Checks the baud rate generator in each serial communications chip against the computer's clock

- **Serial/Infrared Interrupt Test**

  Checks the serial port's ability to send IRQs to the microprocessor

- **Serial/Infrared Internal Transmission Test**

  Checks several internal functions of the serial port using the internal loopback mode of the serial communications chip

- **Serial External Transmission Test**

  If a loopback device is attached, checks the line control bits of the serial port and sends a test pattern at several baud rates, checking the returned values

Why Run a Serial/Infrared Ports Test?

If the Dell Diagnostics does not recognize your computer's serial or infrared ports, enter the System Setup program and check the Serial/infrared Port category to see whether the port has been disabled. The subtests in the Serial/Infrared Ports Test Group cannot test a port unless it is enabled.

When a port is faulty, it may not be immediately evident that the port, and not the device connected to the port, is faulty. Instead, the peripheral (such as a printer or mouse) might behave erratically or not operate at all. If the external device is not properly installed through your software, it also may not function properly. Try operating the peripheral from different programs or through the operating system. If it still does not work, you can eliminate the software configuration as the cause of the problem.

Another possible cause for errors is the external device. Use the documentation that came with the peripheral to troubleshoot it and confirm that it is working properly. (Most printers have a self-test.)

After you eliminate incorrect system configuration information settings, peripheral malfunctions, and software errors as potential causes of port problems, you can run the subtests in the Serial/Infrared Ports Test Group to check your hardware. Although the following symptoms can be caused by faulty peripherals or software errors, they might also suggest a port problem:

- If a peripheral works intermittently or produces intermittent errors, the port may be faulty.
- If the computer displays an error message that is related to the external device connected to a port, but corrections to the device do not resolve the error, run the appropriate subtest in the Serial/Infrared Ports Test Group.
- If your software and the diagnostics do not recognize that you have a serial or infrared port, you should check the Serial/Infrared Port category in the System Setup program, and if necessary, run the appropriate subtest in the Serial/Infrared Ports Test Group.

Parallel Ports Test Group

The subtests in the Parallel Ports Test Group check the computer's interface with external devices, such as a printer, that are connected to the computer through a parallel port. The subtests in this test group are not intended as a diagnostic test for the actual peripheral attached to each port. (The only exception is a printer, as described in the Parallel Internal Test.)

NOTE: If an external loopback connector is not attached to the parallel port, the Parallel External Loopback Test will fail for that port and the results of this test should therefore be ignored.

Subtests

The four subtests in the Parallel Ports Test Group confirm the following port functions:

- **Parallel Internal Test**

  Checks several internal functions of the parallel port

- **Parallel External Loopback Test**

  Tests the functionality of the control lines through an external loopback connector, if an external loopback connector is available

- **Parallel External Interrupt Test**

  Tests the parallel port's ability to generate interrupts from all possible sources, if an external loopback connector or printer is available

- **Parallel Printer Pattern Test**

  Tests a printer and tests the parallel port's ability to send a pattern to the printer, if connected

Why Run a Parallel Ports Test?

If the Dell Diagnostics does not recognize your computer's parallel port, enter the System Setup program and check the Parallel Port category to see if the port has been disabled. The subtests in the Parallel Ports Test Group cannot test a port unless it is enabled.

When a port is faulty, it may not be immediately evident that the port, and not the device connected to the port, is faulty. Instead, the peripheral (such as a printer) might behave erratically or not operate at all. If the external device is not properly installed through your software, it also may not function properly. Try operating the peripheral from different programs or through the operating system. If it still does not work, you can eliminate the software setup as the cause of the problem.

Another possible cause for errors is the external device. Use the documentation that came with the peripheral to troubleshoot it and confirm that it is working properly. (Most printers have a self-test.)

After you eliminate incorrect system configuration information settings, peripheral malfunctions, and software errors as potential causes of port problems, you can run the subtests in the Parallel Ports Test Group to check your hardware. Although the following symptoms can be caused by faulty peripherals or software errors, they might also suggest a port problem:

- If a peripheral works intermittently or produces intermittent errors, the port may be faulty.
- If the computer displays an error message that is related to the external device connected to a port, but corrections to the device do not resolve the error, run

the appropriate subtest in the Parallel Ports Test Group.

- If your software and the Dell Diagnostics do not recognize that you have a parallel port, you should check the Parallel Port category in the System Setup program, and if necessary, run the appropriate subtest in the Parallel Ports Test Group.

SCSI Devices Test Group

The subtests in the SCSI Devices Test Group check the functionality of up to four SCSI host adapters and all the SCSI devices attached to them.

NOTES: Before conducting these subtests on CD-ROM drives, insert a CD with audio and data tracks (such as a multimedia CD) into each CD-ROM drive. All of the subtests, except for the Audio Output Test, require a CD with data tracks. The Audio Output Test requires a CD with audio tracks.

If a CD-ROM drive is empty or if it contains a CD that does not have the required data or audio tracks (depending on the subtest[s] being conducted), the subtest(s) will fail.

Subtests

The seven subtests in the SCSI Devices Test Group confirm the following drive functions:

- **Internal Diagnostic**

  Causes the device to run its internal self-test.

- **Seek Test**

  Checks the device's ability to search for a specified track on the device and to position its read/write heads to all tracks.

- **Read Test**

  Positions the read/write heads at each block of the device for reading data and verifies that all tracks on the device can be read correctly.

- **Write Test**

  Positions the read/write heads at each block of the device and verifies that all tracks on the device can be written to correctly.

- **Audio Output Test**

  Causes the CD-ROM drive to begin playing the first audio track on an audio CD. To determine whether the test passed, listen to the audio output of the drive.

  NOTE: To conduct the Audio Output Test, you must select it individually. It will not run as part of the test group.

- **Eject Removable Media**

  Causes a CD-ROM drive to eject its CD or a SCSI tape drive to eject its tape cartridge.

- **Display Information**

  Displays a screen of information about each SCSI host adapter in the computer, the resources allocated to each SCSI host adapter, and a list of target devices attached to the SCSI host adapter.

Why Run a SCSI Devices Test?

If you check your SCSI hard-disk drive to determine the amount of available space, your operating system will probably report problem areas. Problem areas on hard-disk drives are common, because most hard-disk drives have a small amount of space that is not usable. The hard-disk drive keeps a record of this space so that your computer will not attempt to use it. Identification of unusable disk space, unless it is an unusually large amount (over five percent of the possible total), should not be regarded as a cause for testing the hard-disk drive.

These are the most common symptoms that might prompt you to test a SCSI device:

- A SCSI hard-disk drive fails during the boot routine.
- *Seek* errors are reported by the operating system or application programs.
- An error message appears on the screen stating that the computer cannot read from or write to a SCSI device.
- Data on a SCSI device is corrupted or lost; this problem may be intermittent. Once saved by a program, files cannot be properly recalled.

Network Interface Test Group

The subtests in the Network Interface Test Group verify the basic operation of the network interface controller (NIC). They test its internal functions, including read and write access to its registers and internal transmit and receive (loopback) capability.

Subtests

The subtests in the Network Interface Test Group confirm the following functions:

- **Registers Test**

  Writes patterns to the writable registers in the controller and reads the patterns back to verify whether they are accessible and able to retain data. This subtest also tests interrupt generation and register-specific functionality based on the type of controller.

- **Internal Loopback Test**

  Places the controller into its various internal loopback modes and tests its ability to transmit and receive data.

  NOTE: For some controllers, this test is not applicable.

- **External Loopback Test**

  Places the controller into its various external loopback modes and tests its ability to transmit and receive data. A loopback plug is required to perform this test.

  NOTE: For some controllers, this test is not applicable.

- **Shared RAM Test**

  Performs a memory test on controllers with memory-mapped shared RAM. On controllers with first-in first-out (FIFO)-shared RAM, writes a data pattern to all locations and reads the pattern back to verify the operation. Some controllers do not support shared RAM tests.

- **Display Information**

  Displays addresses and configuration information about the NIC. This information includes the network address used for communication on the local area network (LAN).

Why Run a Network Interface Test?

Running a subtest in the Network Interface Test Group helps diagnose problems that may be encountered while the system is operating in a network environment. Most network failures are caused by one of the following:

- Poor network connections
- Failure in the controller
- Interrupt conflict (the controller trying to use the same IRQ line as another device)
- Software configuration error

If a problem occurs while the system is operating in a network, the network connection should be inspected. If the connection is good, the Network Interface Test Group can be run to indicate whether the NIC is functioning, and if the test group is run in a loop, it can be used to detect intermittent failures.

The Registers Test subtest checks the interrupt generation capability of the controller. The Display Information Test displays the controller's IRQ level. You can then make sure there is not an interrupt conflict by verifying that the IRQ level is not being used by another device in the system.

Audio Test Group

The subtests in the Audio Test Group check the functions of the audio controller and the computer's recording and playback features.

NOTE: The following subtests are only applicable for systems with built-in speakers.

Subtests

The eleven subtests in the Audio Test Group confirm the following functions:

- **Software Reset Test**

  Checks for the presence of an active audio controller in your system

- **Compatibility ID Test**

  Determines if the correct sound controller is installed in your system

- **Interrupt Test**

  Checks to see if the audio controller is generating an interrupt on the IRQ line configured for that controller

- **DMA Test**

  Tests for the presence of a DMA channel on the system chip set, and determines if the DMA controller and audio controller can exchange signals

- **FIFO RAM Test**

  Checks the read/write capabilities and status of the audio controller

- **Initial Reset Status Test**

  Verifies the reset values of the extended registers on the audio controller

- **Internal Register Test**

  Writes test patterns to the internal registers of the audio controller, then reads other registers to confirm that the patterns are correctly interpreted

- **Dual Channel Test**

  Confirms the presence of a second DMA channel on the system chip set and determines if the DMA controller and audio controller can exchange signals on that second DMA channel

- **FM Sound Playback Test**

  Tests whether the system can synthesize sounds and play them through the built-in speakers

- **Analog Sound Playback Test**

  Tests whether the system can play sampled sounds through the built-in speakers

- **Record and Playback Test**

  Checks the ability of the audio controller to generate a sampled sound from signals received from the built-in microphone

Why Run an Audio Test?

If you do not hear sounds from your built-in speakers when you expect to, it is possible that your operating system or sound application uses resource settings different from those of the audio controller in the computer. In the absence of an expected sound, first check the documentation that accompanied your operating system or sound application to see if the sound features are correctly configured to work with the computer. The default settings for the audio controller are:

- DMA channel: 1
- IRQ line: 5
- Port address: 220h

If necessary, change the resource settings in your operating system or sound application to match these default settings.

If you still do not hear sound when you expect to, run the Audio Test Group.

NOTE: Before running the Audio Test group, make sure to enable the built-in speaker(s), and make sure that the speaker volume has not been muted.

Other Test Group

The subtests in the Other Test Group check devices that are currently not covered by one of the other groups.

Subtests

The three subtests in the Other Test Group confirm the following functions:

- **ESM Firmware Status**

  Checks to make sure the embedded server management (ESM) firmware was downloaded correctly and is operational

- **ESM Interface Test**

  Checks the interface between the host and the ESM hardware to ensure all bits in the data port are working properly

- **ESM Sensor Check**

  Verifies the current measurements of the ESM sensors

Chapter 5
Checking Your Equipment

This chapter provides troubleshooting procedures for equipment that connects directly to the input/output (I/O) panel of your computer, such as your monitor, keyboard, mouse, or printer. Before performing any of the procedures in this chapter, see "Checking Connections and Switches" in Chapter 1. Then perform the troubleshooting procedures for the equipment that is malfunctioning.

You need the following items to perform the procedures in this chapter:

- A copy of the *Dell Diagnostics Diskette*
- Your system documentation

NOTE: When you see the question, "Is the problem resolved?" *in a troubleshooting procedure, perform the operation that caused the problem.*

Troubleshooting the Monitor

Troubleshooting video problems involves determining which of the following is the source of the problem:

- Monitor and monitor interface cable
- Video memory
- Video logic of the computer or the high-resolution video expansion card, which overrides the video logic of the computer

The procedures in this section troubleshoot problems with the monitor and the monitor interface cable only. See Chapter 6, "Checking Inside Your Computer," for troubleshooting procedures for video expansion cards, video memory, and your computer's video logic.

If information on the monitor screen is displayed incorrectly or not at all, complete the following steps to determine the problem:

1. **Turn on the system, including any attached peripherals.**
2. **Adjust the switches and controls as specified in the monitor's documentation to correct the video image, including the horizontal and vertical position and size.**

   Is the problem resolved?

   Yes. You have fixed the problem.

   No. Go to step 3.
3. **Insert the *Dell Diagnostics Diskette* into drive A, and reboot the system.**

   Does the monitor display text properly?

   Yes. Go to step 5.

   No. Go to step 4.
4. **Type** `g` **and press the down-arrow key four times. Then press the plus (+) key to send all *error* messages to a printer, or press the plus (+) key twice to send the error messages to a file named** result **on a diskette that you insert into drive A when prompted. If you are running the diagnostics from a utility partition on your hard-disk drive, the** result **file will be saved on the hard-disk drive.**
5. **Run the Video Test Group in the Dell Diagnostics. (See Chapter 4, "Running the Dell Diagnostics.")**

   Most of the tests in the Video Test Group require you to respond before the diagnostics continues with the next test.

Do the tests complete successfully?

Yes. You have fixed the problem.

No. Go to step 6.

6. **Turn off the system and disconnect it from alternating current (AC) power. Swap the monitor with one of the same type that is working, and reconnect the system to AC power.**

7. **Insert the *Dell Diagnostics Diskette* into drive A, reboot the system, and run the Video Test Group again.**

   Do the tests complete successfully?

   Yes. You probably need a new monitor. See Chapter 7, "Getting Help," for instructions on obtaining technical assistance.

   No. If you have a video expansion card installed in your computer, see "Troubleshooting Expansion Cards" in Chapter 6.

Troubleshooting the Keyboard

This procedure determines what kind of keyboard problem you have. If a system error message indicates a keyboard problem when you start up the computer system or during the Dell Diagnostics, complete the following steps:

1. **Look at the keyboard and the keyboard cable for any signs of damage. Press and release each key on the keyboard.**

   Do the keyboard and its cable appear to be free of physical damage, and do the keys work?

   Yes. Go to step 3.

   No. Go to step 2.

2. **Swap the faulty keyboard with a working keyboard.**

   To swap a faulty keyboard, unplug the keyboard cable from your computer's back panel and plug in a working keyboard.

   Is the problem resolved?

   Yes. You probably need a new keyboard. See Chapter 7, "Getting Help," for instructions on obtaining technical assistance.

   No. Go to step 3.

3. **Insert the *Dell Diagnostics Diskette* into drive A, reboot the system, and run the Keyboard Test Group in the Dell Diagnostics. (See Chapter 4, "Running the Dell Diagnostics.")**

   Can you use the keyboard to select the Keyboard Test Group?

   Yes. Go to step 4.

   No. Go to step 5.

4. **Does the Keyboard Interactive Test complete successfully?**

   Yes. Go to step 6.

   No. Go to step 5.

5. **Swap the faulty keyboard with a working keyboard.**

6. **Does the Keyboard Controller Test complete successfully?**

   Yes. You need a new keyboard. See Chapter 7, "Getting Help," for instructions on obtaining technical assistance.

   No. See Chapter 7, "Getting Help," for instructions on obtaining technical assistance.

Troubleshooting I/O Ports

This section provides a procedure for troubleshooting the ports on your computer's I/O panel and the equipment connected to them, such as a printer, scanner, or other peripheral device.

You can also use this procedure to test I/O ports on expansion cards. However, you should first complete the procedures in "Troubleshooting Expansion Cards" in Chapter 6 to verify that the card is configured and installed correctly.

If a system error message indicates a port problem or if equipment connected to a port seems to perform

incorrectly or not at all, the source of the problem may be any of the following:

- A faulty connection between the I/O port and the peripheral device
- A faulty cable between the I/O port and the peripheral device
- A faulty peripheral device
- Incorrect settings in the System Setup program
- Incorrect settings in the system's configuration files
- Faulty I/O port logic on the system board

NOTE: With certain modems installed, the Serial Port Test Group subtests may fail because the modem appears to the diagnostics as a serial port, but it cannot be tested as a serial port. If you have a modem installed and you experience a serial-port test failure, remove the modem and run the diagnostic tests again.

Troubleshooting the Basic I/O Functions

This procedure determines whether the computer's basic I/O functions are operational. If a system error message indicates an I/O port problem or the device connected to the port does not function properly, follow these steps:

1. **Enter the System Setup program and check the settings for the Serial Port 1, Serial Port 2, Parallel Port, and Mouse categories.**

   NOTE: Not all systems have a Mouse category in the System Setup program.

   Are the communication port categories set to Auto, and is the Mouse category set to On?

   Yes. Go to step 3.

   No. Go to step 2.

2. **Change the setting for the Serial Port 1, Serial Port 2, and Parallel Port categories to Auto, and change the setting for the Mouse category to On; then reboot the system.**

   Is the problem resolved?

   Yes. You have fixed the problem.

   No. Go to step 3.

3. **Check the contents of your start-up files (such as** autoexec.bat **and** config.sys**). (See "Installing and Configuring Software" in Chapter 3.)**

   Are the port configuration commands correct?

   Yes. Go to step 5.

   No. Go to step 4.

4. **Change the necessary statements in the start-up files.**

   If the port problem is confined to a particular application program, see the application program's documentation for specific port configuration requirements.

   Is the problem resolved?

   Yes. You have fixed the problem.

   No. Go to step 5.

5. **Insert the *Dell Diagnostics Diskette* into drive A, reboot the system, and run the Serial/ Infrared Ports Test Group and/or the Parallel Ports Test Group in the Dell Diagnostics. (See Chapter 4, "Running the Dell Diagnostics.")**

   The Serial/Infrared Ports Test Group and the Parallel Ports Test Group test the basic functions of the system board's I/O port logic. Also, if a parallel printer is connected to the parallel port, the Parallel Ports Test Group tests the communication link between the system board's I/O port logic and the printer.

   Do the tests complete successfully?

   Yes. Go to step 6.

   No. See Chapter 7, "Getting Help," for instructions on obtaining technical assistance.

6. **If the problem persists, go to "Troubleshooting a Parallel Printer" or "Troubleshooting a Serial I/O Device" found later in this chapter, depending on which device appears to be malfunctioning.**

Troubleshooting a Parallel Printer

If the preceding procedure, "Troubleshooting the Basic I/O Functions," indicates that the problem is with a parallel printer, follow these steps:

1. **Turn off the parallel printer and computer.**
2. **Swap the parallel printer interface cable with a known working cable.**
3. **Turn on the parallel printer and computer.**
4. **Attempt a print operation on the parallel printer.**

   Does the print operation complete successfully?

   Yes. You probably need a new interface cable. See Chapter 7, "Getting Help," for instructions on obtaining technical assistance.

   No. Go to step 5.
5. **Run the parallel printer's self-test.**

   Does the self-test complete successfully?

   Yes. Go to step 6.

   No. The printer is probably defective. If you bought the printer from Dell, see Chapter 7, "Getting Help," for instructions on obtaining technical assistance. If you bought the printer elsewhere, take it to one of the manufacturer's authorized service centers for repair.
6. **Attempt another print operation on the parallel printer.**

   Does the print operation complete successfully?

   Yes. You have fixed the problem.

   No. See Chapter 7, "Getting Help," for instructions on obtaining technical assistance.

Troubleshooting a Serial I/O Device

If the procedure titled "Troubleshooting the Basic I/O Functions" indicates that the problem is with a device connected to one of the serial ports, follow these steps:

1. **Turn off the computer and any peripheral devices connected to the serial ports.**

   Are two serial devices connected to the computer?

   Yes. Go to step 2.

   No. Go to step 4.
2. **Disconnect the devices from serial ports 1 and 2, and connect the malfunctioning serial device to the opposite port.**
3. **Turn on the computer and the reconnected serial device.**

   Is the problem resolved?

   Yes. The serial port may be defective. See Chapter 7, "Getting Help," for instructions on obtaining technical assistance.

   No. Go to step 4.
4. **Turn off the computer and the serial device, and swap the interface cable (that connects the device to the serial port) with a known working cable.**
5. **Turn on the computer and the serial device.**

   Is the problem resolved?

   Yes. You probably need a new interface cable. See Chapter 7, "Getting Help," for instructions on obtaining technical assistance.

   No. Go to step 6.
6. **Turn off the computer and the serial device, and swap the device with a comparable working device.**

   For example, if your serial mouse has a problem, swap it with a serial mouse you know is working properly.
7. **Turn on the computer and the serial device.**

   Is the problem resolved?

   Yes. You probably need a new device. See Chapter 7, "Getting Help," for instructions on obtaining technical assistance.

   No. See Chapter 7, "Getting Help," for instructions on obtaining technical assistance.

Chapter 6
Checking Inside Your Computer

This chapter provides troubleshooting procedures for components inside your computer. Before you start any of the procedures in this chapter, do the following:

- Perform the procedures described in "Checking Connections and Switches" and "The System Setup Program" in Chapter 1.
- Read the safety instructions in "Safety First—For You and Your Computer" found next in this chapter.

You need the following items to perform the procedures in this chapter:

- A copy of the *Dell Diagnostics Diskette*
- Your system documentation
- A small flat-blade screwdriver and a #1 Phillips-head screwdriver (or quarter-inch hex-nut driver)

NOTE: When you see the question, "Is the problem resolved?" *in a troubleshooting procedure, perform the operation that caused the problem.*

Safety First—For You and Your Computer

The procedures in this chapter require that you remove the cover and work inside your computer. While working inside your computer, do not attempt to service the computer except as explained in this guide and elsewhere in Dell documentation. Always follow the instructions closely.

Working inside your computer is safe—*if* you observe the following precautions.

WARNING FOR YOUR PERSONAL SAFETY AND PROTECTION OF YOUR EQUIPMENT

Before starting to work on your computer, perform the following steps in the sequence indicated:

1. ***Turn off* your computer and all peripherals.**
2. ***Disconnect* your computer and peripherals from their power sources. Doing so reduces the potential for personal injury or shock. Also disconnect any telephone or telecommunication lines from the computer.**
3. ***Touch* an unpainted metal surface on the computer chassis, such as the metal around the card-slot openings at the back of your computer, before touching anything inside your computer.**

   While you work, periodically touch an unpainted metal surface on the computer chassis to dissipate any static electricity that might harm internal components.

In addition, Dell recommends that you periodically review the safety instructions at the front of this guide.

Removing and Replacing the Computer Cover

To troubleshoot problems inside your computer, you need to remove the computer cover. Instructions for removing the computer cover are in your system documentation.

When you finish your troubleshooting procedure, replace the cover of your computer by following the steps outlined in your system documentation.

Troubleshooting a Wet Computer

Liquids can damage your computer. While you are not likely to submerge your computer, spills, splashes, and excessive humidity can also cause damage. If an external device (such as a printer or an external drive) gets wet, contact the manufacturer for instructions. If your computer gets wet, complete the following steps:

1. **Turn off the system, including any attached peripherals, and disconnect all the alternating current (AC) power cables from their power sources. Also, disconnect any telephone or telecommunication lines from the computer.**

2. **Remove the computer cover.**

   CAUTION: See "Protecting Against Electrostatic Discharge" in the safety instructions at the front of this guide.

3. **Let the computer dry for at least 24 hours.**

   Make sure that it is thoroughly dry before proceeding.

4. **Remove all expansion cards installed in the computer except a drive controller card and video expansion card (if applicable).**

   See your system documentation for instructions.

5. **Replace the computer cover, reconnect the system to AC power, and turn it on.**

   Does the system have power?

   Yes. Go to step 6.

   No. See Chapter 7, "Getting Help," for instructions on obtaining technical assistance.

6. **Turn off the system, disconnect it from AC power, remove the computer cover, and reinstall all expansion cards you removed in step 4.**

   See your system documentation for instructions.

7. **Replace the computer cover, and reconnect the system to AC power. Also, reconnect any telephone or telecommunication lines to the computer.**

8. **Insert the *Dell Diagnostics Diskette* into drive A, reboot the system, and run the System Set Test Group in the Dell Diagnostics. (See Chapter 4, "Running the Dell Diagnostics.")**

   Do the tests complete successfully?

   Yes. Your system is operating properly.

   No. See Chapter 7, "Getting Help," for instructions on obtaining technical assistance.

Troubleshooting a Damaged Computer

If your computer was dropped or damaged, you should check your computer to see if it functions properly. If an external device attached to your computer is dropped or damaged, contact the manufacturer of the device for instructions or see Chapter 7, "Getting Help," for information on obtaining technical assistance from Dell. Follow these steps to troubleshoot a damaged computer:

1. **Turn off the system, including any attached peripherals, and disconnect all the AC power cables from their power sources. Also, disconnect any telephone or telecommunication lines from the computer.**

2. **Remove the computer cover.**

   CAUTION: See "Protecting Against Electrostatic Discharge" in the safety instructions at the front of this guide.

3. **Check all the expansion-card connections in the computer.**

   See your system documentation for instructions.

4. **Verify the diskette/tape drive, hard-disk drive, and all other internal connections (including options such as video-memory upgrade modules, math coprocessors, and microprocessor upgrades).**

Make sure that all cables are properly connected and that all components are properly seated in their connectors and sockets.

See your system documentation for instructions.

5. **Replace the computer cover, reconnect the system to AC power, and reconnect any telephone or telecommunication lines.**

6. **Insert the *Dell Diagnostics Diskette* into drive A, and reboot the system.**

7. **Run the System Set Test Group in the Dell Diagnostics. (See Chapter 4, "Running the Dell Diagnostics.")**

   Do the tests complete successfully?

   Yes. Your system is operating properly.

   No. See Chapter 7, "Getting Help," for instructions on obtaining technical assistance.

Troubleshooting the Battery

WARNING

There is a danger of a new battery exploding if it is incorrectly installed. Replace the battery only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.

If an error message indicates a problem with the battery or if the System Setup program loses the system configuration information when the computer is turned off, the battery may be defective.

Follow these steps to troubleshoot the battery:

1. **Turn off the system, including any attached peripherals, and disconnect all the AC power cables from their power sources. Also, disconnect any telephone or telecommunication lines from the computer.**

2. **Remove the computer cover.**

   CAUTION: See "Protecting Against Electrostatic Discharge" in the safety instructions at the front of this guide.

3. **Check the connection of the battery to the system board.**

   Some systems have a coin cell battery that snaps into a socket on the system board. Other systems have a battery with a cable that attaches to a header connector on the system board.

   Is the battery firmly attached to the battery socket or connector on the system board?

   Yes. Go to step 5.

   No. Go to step 4.

4. **Reseat the battery in its socket, or reconnect the battery cable to the system board.**

   Is the problem resolved?

   Yes. The connection was loose. You have fixed the problem.

   No. Go to step 5.

5. **Replace the battery.**

   See your system documentation for instructions.

   Is the problem resolved?

   Yes. The battery's charge was low. You have fixed the problem.

   No. See Chapter 7, "Getting Help," for instructions on obtaining technical assistance.

Troubleshooting Expansion Cards

If an error message indicates an expansion-card problem or if an expansion card seems to perform incorrectly or not at all, the problem could be a faulty connection, a conflict with software or other hardware, or a faulty expansion card. Follow these steps to troubleshoot expansion cards:

1. **Turn off the system, including any attached peripherals, and disconnect all the AC power cables from their power sources. Also, disconnect any telephone or telecommunication lines from the computer.**

2. **Remove the computer cover.**

   CAUTION: See "Protecting Against Electrostatic Discharge" in the safety instructions at the front of this guide.

3. **Verify that each expansion card is firmly seated in its connector.**

   Are the expansion cards properly seated in their connectors?

   Yes. Go to step 5.

   No. Go to step 4.

4. **Reseat the expansion cards in their connectors.**

   See your system documentation for instructions.

   Is the problem resolved?

   Yes. The connection was loose. You have fixed the problem.

   No. Go to step 5.

5. **Verify that the appropriate cables are firmly connected to their corresponding connectors on the expansion cards.**

   For instructions on which cables should be attached to specific connectors on an expansion card, see the expansion card's documentation.

   Are the appropriate cables firmly attached to their connectors?

   Yes. Go to step 7.

   No. Go to step 6.

6. **Reconnect the cable connectors to the appropriate connectors on the expansion cards.**

   Is the problem resolved?

   Yes. The cable connections were loose. You have fixed the problem.

   No. Go to step 7.

7. **Inspect all jumpers and configuration switches on each expansion card.**

   Most Industry-Standard Architecture (ISA) expansion cards have configuration settings for an interrupt request (IRQ) line, a direct memory access (DMA) channel, and a base-memory or basic input/output system (BIOS) address. To keep expansion cards from conflicting with each other, you need to know both the starting memory address and the amount of memory required by each card. For instructions on jumpers and configuration settings, see the expansion card's documentation.

   Is each expansion card configured correctly?

   Yes. Go to step 9.

   No. Go to step 8.

8. **Reconfigure the card according to the instructions in the card's documentation.**

   Is the problem resolved?

   Yes. The memory configuration of the card was incorrect. You have fixed the problem.

   No. Go to step 9.

9. **Inspect all configuration jumpers on the system board to ensure that they are configured correctly for any installed expansion cards.**

   For information on the configuration jumpers and their settings, see your system documentation.

   Are the system board's configuration jumpers set correctly?

   Yes. Go to step 11.

   No. Go to step 10.

10. **Correct the system board's configuration jumper settings.**

    Is the problem resolved?

    Yes. You have fixed the problem.

    No. Go to step 11.

11. **Remove all expansion cards except the hard-disk drive controller card (if one is installed).**

    See your system documentation for instructions.

12. **Replace the computer cover, reconnect the system to AC power, and turn it on.**

13. **Enter the System Setup program, and update the system configuration information.**

14. **Insert the *Dell Diagnostics Diskette* into drive A, reboot the system, and run the RAM Test Group in the Dell Diagnostics. (See Chapter 4, "Running the Dell Diagnostics.")**

    Do the tests complete successfully?

    Yes. Go to step 15.

    No. See Chapter 7, "Getting Help," for information on obtaining technical assistance.

15. **Turn off the system, disconnect it from AC power, and remove the computer cover.**

16. **Reinstall one of the expansion cards you removed in step 11, and repeat steps 12 and 13.**

17. **Insert the *Dell Diagnostics Diskette* into drive A, and reboot the system. Run the RAM Test Group in the Dell Diagnostics.**

    Do the tests complete successfully?

    Yes. Go to step 18.

    No. See Chapter 7, "Getting Help," for information on obtaining technical assistance.

18. **Remove the *Dell Diagnostics Diskette* from drive A. Repeat steps 15, 16, and 17 for each of the remaining expansion cards that you removed in step 11.**

    Have you reinstalled all of the expansion cards without encountering a test failure?

    Yes. You have fixed the problem.

    No. See Chapter 7, "Getting Help," for information on obtaining technical assistance.

Troubleshooting System Memory

A computer memory problem can be a faulty single in-line memory module (SIMM), an improperly configured or faulty memory expansion card (if one is installed), or a faulty system board. If a random-access memory (RAM) error message appears, the computer probably has a memory problem.

When you turn on or reboot the system, the Caps Lock and Scroll Lock indicators on the keyboard should flash momentarily and then turn off. If the Num Lock category in the System Setup program is set to On, the Num Lock indicator should flash momentarily and then remain on; otherwise, it should turn off. Abnormal operation of these indicators can result from a defective SIMM in socket A. Follow these steps to troubleshoot system memory:

1. **Turn on the system, including any attached peripherals.**

    Does an error message appear indicating invalid system configuration information after the memory count completes?

    Yes. Go to step 2.

    No. Go to step 8.

2. **Enter the System Setup program to check the Total Memory or System Memory category.**

    Does the amount of memory installed match the Total Memory or System Memory setting?

    Yes. Go to step 8.

    No. Go to step 3.

3. **Turn off the system, including any attached peripherals, and disconnect all the AC power cables from their power sources. Also, disconnect any telephone or telecommunication lines from the computer.**

4. **Remove the computer cover.**

> **CAUTION: See "Protecting Against Electrostatic Discharge" in the safety instructions at the front of this guide.**

5. **Reseat the SIMMs in their sockets.**

   See your system documentation for instructions.

6. **Replace the computer cover, reconnect the system to AC power, and turn it on.**

7. **Enter the System Setup program to check the Total Memory or System Memory category again.**

   Does the amount of memory installed match the Total Memory or System Memory setting?

   Yes. Go to step 8.

   No. Go to step 9.

8. **Reboot the system, and observe the monitor screen and the Num Lock, Caps Lock, and Scroll Lock indicators on the keyboard.**

   Does the monitor screen remain blank, and do the Num Lock, Caps Lock, and Scroll Lock indicators on the keyboard remain on?

   Yes. Go to step 9.

   No. Go to step 11.

9. **Turn off the system, disconnect it from AC power, and remove the computer cover.**

10. **If possible, swap the SIMM in socket A with one of the same capacity, reboot the system, and observe the monitor screen and the indicators on the keyboard.**

    Is the problem resolved?

    Yes. You have fixed the problem.

    No. Go to step 11.

11. **Determine whether there is a memory expansion card installed in an expansion slot.**

    Is a memory expansion card installed?

    Yes. Go to step 12.

    No. Go to step 14.

12. **Check the memory expansion card's documentation to determine whether the card is configured correctly.**

    Is the memory expansion card configured correctly?

    Yes. Go to step 13.

    No. Go to step 14.

13. **Reconfigure the memory expansion card.**

14. **Replace the computer cover, reconnect the system to AC power, reconnect any telephone or telecommunication lines and turn it on.**

15. **Insert the *Dell Diagnostics Diskette* into drive A, reboot the system, and run the RAM Test Group in the Dell Diagnostics. (See Chapter 4, "Running the Dell Diagnostics.")**

    Do the tests complete successfully?

    Yes. You have fixed the problem.

    No. See Chapter 7, "Getting Help," for instructions on obtaining technical assistance.

Troubleshooting the Video Subsystem

Troubleshooting video problems involves determining which of the following is the source of the problem: the monitor, the monitor interface cable, the video memory, or the video logic of the computer. You can also have a high-resolution video expansion card installed, which overrides the video logic of the computer.

The following procedure troubleshoots problems with the video memory and video logic only. Before you begin, perform the procedure found in "Troubleshooting the Monitor" in Chapter 5 to determine whether or not the monitor is the source of the problem.

If you have a high-resolution video expansion card, first complete the steps in “Troubleshooting Expansion Cards” found earlier in this chapter to verify that the card is configured and installed correctly.

Follow these steps to troubleshoot the video subsystem:

1. **Insert the *Dell Diagnostics Diskette* into drive A, reboot the system, and run the Video Test Group in the Dell Diagnostics. (See Chapter 4, “Running the Dell Diagnostics.”)**

   Most of the tests in the Video Test Group are interactive; that is, you must respond before the diagnostics continues with the next test.

   Do the tests complete successfully?

   Yes. It is not a video hardware problem. Go to Chapter 3, “Finding Software Solutions.”

   No. Go to step 2.

2. **Turn off the system, including any attached peripherals, and disconnect all the AC power cables from their power sources. Also, disconnect any telephone or telecommunication lines from the computer.**

3. **Remove the computer cover.**

   CAUTION: See “Protecting Against Electrostatic Discharge” in the safety instructions at the front of this guide.

4. **Check the system-board configuration jumpers.**

   See your system documentation for a list of the system board jumpers and their settings.

   Are the jumpers set correctly?

   Yes. Go to step 9.

   No. Go to step 5.

5. **Correct the configuration jumper settings on the system board.**

6. **Replace the computer cover, reconnect the system to AC power, reconnect any telephone or telecommunication lines and turn it on.**

7. **Insert the *Dell Diagnostics Diskette* into drive A, and reboot the system. Run the Video Test Group again.**

   Is the problem resolved?

   Yes. The configuration jumpers were set incorrectly. You have fixed the problem.

   No. Go to step 8.

8. **Turn off the system, disconnect it from AC power, and remove the computer cover. Also, disconnect any telephone or telecommunication lines from the computer.**

9. **Determine whether a video-memory upgrade module is installed.**

   See your system documentation for the location of the video-memory upgrade module.

   Is a video-memory upgrade module installed?

   Yes. Go to step 10.

   No. Go to step 11.

10. **Reseat the video-memory upgrade module.**

    See your system documentation for instructions.

11. **Replace the computer cover, reconnect the system to AC power, reconnect any telephone or telecommunication lines and turn it on.**

12. **Insert the *Dell Diagnostics Diskette* into drive A, and reboot the system. Run the Video Test Group again.**

    Do the tests complete successfully?

    Yes. The video-memory upgrade module was not connected properly. You have fixed the problem.

    No. Go to step 13.

13. **Turn off the system, disconnect it from AC power, and remove the computer cover. Also, disconnect any telephone or telecommunication lines from the computer.**

14. **Determine whether a video expansion card is installed.**

    Is a video expansion card installed?

    Yes. Go to step 15.

No. See Chapter 7, "Getting Help," for instructions on obtaining technical assistance.

15. **Remove the video expansion card, and repeat steps 11 and 12.**

    Do the tests complete successfully?

    Yes. The video expansion card is faulty. See Chapter 7, "Getting Help," for instructions on obtaining technical assistance.

    No. See Chapter 7, "Getting Help," for instructions on obtaining technical assistance.

Troubleshooting the System Board

A system board problem can result from a defective system board component, a faulty power supply, or a defective component connected to the system board. If an error message indicates a system board problem, follow these steps to find the problem:

1. **Turn off the system, including any attached peripherals, and disconnect all the AC power cables from their power sources. Also, disconnect any telephone or telecommunication lines from the computer.**
2. **Remove the computer cover.**

    > **CAUTION: See "Protecting Against Electrostatic Discharge" in the safety instructions at the front of this guide.**

3. **Remove all expansion cards except the hard-disk drive controller card and the video expansion card (if they are installed).**
4. **Replace the computer cover, reconnect the system to AC power, and turn it on.**
5. **Enter the System Setup program, and update the system configuration information.**
6. **Insert the *Dell Diagnostics Diskette* into drive A, and reboot the system. Run the System Set Test Group in the Dell Diagnostics. (See Chapter 4, "Running the Dell Diagnostics.")**

    Do the tests complete successfully?

    Yes. Go to step 7.

    No. Go to step 12.

7. **Remove the *Dell Diagnostics Diskette* from drive A , turn off the system, disconnect it from AC power, and remove the computer cover.**
8. **Reinstall one of the expansion cards you removed in step 3, and repeat steps 4 and 5.**

    See your system documentation for instructions.

9. **Insert the *Dell Diagnostics Diskette* into drive A, and reboot the system. Run the System Set Test Group again.**

    Do the tests complete successfully?

    Yes. Go to step 10.

    No. Go to step 12.

10. **Turn off the system, disconnect it from AC power, and remove the computer cover.**
11. **Repeat steps 7, 8, and 9 for each of the remaining expansion cards you removed in step 3.**

    Have you reinstalled all of the expansion cards without encountering a test failure?

    Yes. Go to step 12.

    No. Your expansion card is faulty. See Chapter 7, "Getting Help," for instructions on obtaining technical assistance.

12. **Disconnect the keyboard and reboot the system.**

    Does the system boot successfully?

    Yes. Go to step 13.

    No. Go to step 14.

13. **Swap the keyboard with a comparable working keyboard, and run the System Set Test Group again.**

    Do the tests complete successfully?

    Yes. You have fixed the problem.

    No. Go to step 14.

14. **See Chapter 7, "Getting Help," for instructions on obtaining technical assistance.**

Troubleshooting the Diskette/ Tape Drive Subsystem

If the monitor displays a system error message indicating a diskette drive problem during execution of either the boot routine or the Dell Diagnostics, the problem may be caused by any of the following conditions:

- The system configuration settings do not match the physical diskette/tape drive subsystem configuration.
- The diskette/tape drive cables are not properly connected or are faulty.
- An expansion card is interfering with proper drive operations.
- A diskette drive may be improperly configured.
- The diskette drive or tape drive is faulty.
- The computer's power supply is not providing sufficient power for the drives.
- The computer's diskette/tape drive logic is faulty.

In any computer that has multiple drives, a problem with one drive can affect the entire subsystem. Therefore, the troubleshooting procedures for the diskette/tape drive subsystem are divided into the following subsections:

- "Checking the Diskette/Tape Drive Subsystem"
- "Troubleshooting a Diskette-Drive Subsystem"
- "Troubleshooting a Non-SCSI Internal Tape Drive"
- "Troubleshooting a SCSI Tape Drive"

Before you begin the troubleshooting procedures, complete steps 1 and 2 in the next subsection, "Checking the Diskette/Tape Drive Subsystem," to verify that the system configuration information is correct for the installed diskette drive(s).

If, after completing these steps, the system boots correctly and the monitor no longer displays a system error message, the problem is resolved. If you continue to have problems, however, proceed with the appropriate diskette/tape drive subsystem troubleshooting procedure.

Checking the Diskette/Tape Drive Subsystem

To verify that the diskette/tape drive subsystem is operating properly, follow these steps:

1. **Enter the System Setup program, and verify that the system is configured correctly for the Diskette Drive A and Diskette Drive B categories.**

    See your system documentation for instructions.

2. **If the system configuration settings are incorrect, make the necessary corrections in the System Setup program, and then reboot the system.**

3. **Insert the *Dell Diagnostics Diskette* into drive A, reboot the system, and run the Diskette Drives Test Group in the Dell Diagnostics to see whether the diskette/tape drive subsystem now works correctly.**

    See Chapter 4, "Running the Dell Diagnostics," for more information.

    Do the tests complete successfully?

    Yes. Continue with the next step in the procedure you were performing.

    No. See Chapter 7, "Getting Help," for instructions on obtaining technical assistance.

Troubleshooting a Diskette-Drive Subsystem

If you receive a system error message indicating a diskette drive problem, insert the *Dell Diagnostics Diskette* into drive A, and reboot the system by turning the computer off, allowing the hard-disk drive(s) to spin down, and turning the computer on again.

NOTE: You must leave the Dell Diagnostics Diskette *in drive A throughout this entire procedure except for steps that specifically require you to remove it.*

Follow these steps to troubleshoot a diskette-drive subsystem:

1. **Turn off the system, including any attached peripherals, and disconnect all the AC power cables from their power sources. Also, disconnect any telephone or telecommunication lines from the computer.**

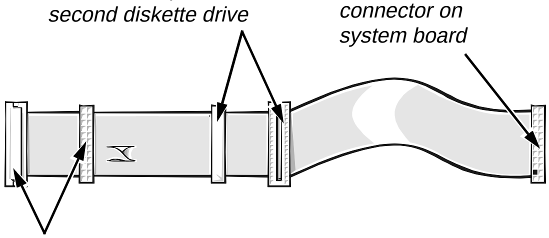
2. **Remove the computer cover.**

> **CAUTION: See "Protecting Against Electrostatic Discharge" in the safety instructions at the front of this guide.**

3. **Check the diskette drive cabling.**

   See your system documentation for the location of your diskette drive and cabling.

   The diskette drive should be connected to the drive A connector on the diskette/tape drive interface cable.



   Is the diskette drive securely connected to the proper diskette/tape drive interface cable connector? Is the diskette/tape drive interface cable connector securely connected to the interface connector on the system board? Is the drive's direct current (DC) power cable firmly connected to the drive?

   Yes. Go to step 5.

   No. Go to step 4.

4. **Reconnect the cable connectors.**

5. **Replace the computer cover, reconnect the system to AC power, insert the *Dell Diagnostics Diskette* into drive A, and reboot the system.**

   Does the system boot properly from the Dell Diagnostics Diskette?

   Yes. Go to "Checking the Diskette/Tape Drive Subsystem" found earlier in this chapter.

   No. Go to step 6.

6. **Repeat steps 1 and 2, and remove all expansion cards.**

   See your system documentation for instructions.

7. **Replace the computer cover, reconnect the system to AC power, insert the *Dell Diagnostics Diskette* into drive A, and reboot the system.**

   Does the system boot properly from the *Dell Diagnostics Diskette*?

   Yes. An expansion card may be conflicting with the diskette/tape drive logic, or you may have a faulty expansion card. Go to "Checking the Diskette/Tape Drive Subsystem" found earlier in this chapter.

   No. Go to step 8.

8. **Repeat steps 1 and 2, and reinstall one of the expansion cards you removed in step 6.**

9. **Replace the computer cover, reconnect the system to AC power, insert the *Dell Diagnostics Diskette* into drive A, and reboot the system.**

   Does the system boot properly from the *Dell Diagnostics Diskette*?

   Yes. Go to step 10.

   No. Go to step 11.

10. **Repeat steps 8 and 9 until all expansion cards have been reinstalled or until one of the expansion cards prevents the system from booting from the *Dell Diagnostics Diskette*.**

11. **Repeat steps 1 and 2. Verify that the drive's termination is enabled and that the drive-select jumper is set to the DS1 position.**

    NOTE: Some diskette drives may require you to remove the drive from the computer to access the termination and drive-select jumper.

For information about the drive's termination and drive-select jumper settings, refer to the documentation for the drive.

Is the drive configured correctly?

Yes. Go to step 14.

No. Go to step 12.

12. **Correct the drive-select jumper setting and terminator installation.**

13. **Replace the computer cover, reconnect the system to AC power, insert the *Dell Diagnostics Diskette* into drive A, and reboot the system.**

    Does the system boot properly from the *Dell Diagnostics Diskette*?

    Yes. Go to "Checking the Diskette/Tape Drive Subsystem" found earlier in this chapter.

    No. Go to step 14.

14. **See Chapter 7, "Getting Help," for instructions on obtaining technical assistance.**

Troubleshooting a Non-SCSI Internal Tape Drive

In a drive configuration containing both a single diskette drive and an internal tape drive that is not a small computer system interface (SCSI) drive, the diskette drive and the tape drive are connected, respectively, to the drive A and drive B connectors on the diskette/tape drive interface cable. When the internal diskette/tape drive subsystem is configured in this manner, the Drive B category on the System Board Options screen in the EISA Configuration Utility and the Diskette Drive B category in the System Setup program must be set to Not Installed to prevent interference with tape drive operation.

NOTE: Some systems may have an external tape drive, in which case a special tape-drive controller card must be installed in one of the expansion slots. The troubleshooting procedure in this subsection applies specifically to internal tape drives.

Tape drive problems usually result from a defective tape drive, a defective tape cartridge, or software. Follow these steps to troubleshoot a non-SCSI internal tape drive:

1. **Remove the tape that was in use when the problem occurred, and replace it with a tape that you know is not defective.**

   Is the problem resolved?

   Yes. The original tape was defective. Replace it with a new tape. You have fixed the problem.

   No. Go to step 2.

2. **Remove any installed terminate-and-stay-resident (TSR) programs.**

   See "Memory-Resident Programs" in Chapter 3 for information about unloading TSR programs.

   Is the problem resolved?

   Yes. The TSR program was conflicting with the tape backup software. You have fixed the problem.

   No. Go to step 3.

3. **Reinstall the tape backup software as instructed in the tape-backup software documentation.**

   Is the problem resolved?

   Yes. The tape backup software was corrupted. You have fixed the problem.

   No. Go to step 4.

4. **If the system contains a single diskette drive, enter the System Setup program, and verify that the Diskette Drive B category is set to Not Installed.**

   See your system documentation for instructions.

   Is the Diskette Drive B category set to Not Installed?

   Yes. Go to step 6.

   No. Go to step 5.

5. **Correct the Diskette Drive B category setting.**

   Is the problem resolved?

   Yes. The system configuration information was incorrect. You have fixed the problem.

   No. Go to step 6.

6. **Turn off the system, including any attached peripherals, and disconnect all the AC power cables from their power sources. Also, disconnect any telephone or telecommunication lines from the computer.**
7. **Remove the computer cover.**

> **CAUTION: See "Protecting Against Electrostatic Discharge" in the safety instructions at the front of this guide.**

8. **Check the interface cable connections to the tape drive and to the interface connector on the system board or the controller card (if one is installed). Check the DC power cable connection to the tape drive.**

   Are the cables firmly connected?

   Yes. Go to step 10.

   No. Go to step 9.

9. **Reseat the cable connectors, replace the computer cover, reconnect the system to AC power, and turn it on.**

   Is the problem resolved?

   Yes. The connections were loose. You have fixed the problem.

   No. Go to step 10.

10. **Turn off the system, disconnect it from AC power, and remove the computer cover.**
11. **Remove the tape drive, and ensure that the input/output (I/O) address and IRQ jumper settings do not conflict with any other device's settings.**

    See "Avoiding Interrupt Assignment Conflicts" in Chapter 3. For information on setting the jumpers, see the documentation for the tape drive.

    Are the drive's jumpers positioned correctly?

    Yes. Go to step 13.

    No. Go to step 12.

12. **Correct the drive's jumper settings according to the documentation for the tape drive, and reinstall the tape drive.**
13. **Replace the computer cover, reconnect the system to AC power, reconnect any telephone or telecommunication lines, and turn on the computer.**

    Is the problem resolved?

    Yes. The IRQ jumper settings were incorrect. You have fixed the problem.

    No. See Chapter 7, "Getting Help" for instructions on obtaining technical assistance.

Troubleshooting a SCSI Tape Drive

A SCSI tape drive can be either an internal device installed in one of the externally accessible drive bays or an external device that attaches to a SCSI host adapter connector on the back panel of the computer. In either case, the SCSI tape drive is controlled by a SCSI host adapter installed in the computer, which may also control other SCSI devices connected to one or more SCSI cables. SCSI devices sometimes require device drivers for the particular operating system being used by the computer system.

Tape drive problems often result from a defective tape drive, a defective tape cartridge, or software. Follow these steps to troubleshoot a SCSI tape drive:

1. **Remove the tape that was in use when the problem occurred, and replace it with a tape that you know is not defective.**

   Is the problem resolved?

   Yes. The original tape was defective. Replace it with a new tape. You have fixed the problem.

   No. Go to step 2.

2. **Remove any installed TSR programs.**

   See "Memory-Resident Programs" in Chapter 3 for information about unloading TSR programs.

   Is the problem resolved?

   Yes. The TSR program was conflicting with the tape backup software. You have fixed the problem.

   No. Go to step 3.

3. **Verify that any required SCSI device drivers are installed on the hard-disk drive and are configured correctly.**

   If the computer system is using a built-in SCSI host adapter or a Dell Advanced SCSI Host (DASH) Bus Adapter card, see the *SCSI Device Driver Installation and Configuration Guide* for instructions on installing and configuring the SCSI device drivers. For any other type of SCSI host adapter card, see the documentation that accompanied the host adapter card.

   Are the drivers installed and configured correctly?

   Yes. The SCSI device drivers were installed or configured incorrectly or were corrupted. You have fixed the problem.

   No. Go to step 4.

4. **Reinstall the tape backup software as instructed in the tape-backup software documentation.**

   Is the problem resolved?

   Yes. The tape backup software was corrupted. You have fixed the problem.

   No. Go to step 5.

5. **Turn off the system, including any attached peripherals, and disconnect all the AC power cables from their power sources. Also, disconnect any telephone or telecommunication lines from the computer.**

6. **Remove the computer cover.**

   CAUTION: See "Protecting Against Electrostatic Discharge" in the safety instructions at the front of this guide.

7. **Check the SCSI cable connections to the tape drive and to the SCSI host adapter connector. If the tape drive is an internal device, check the DC power cable connection to the tape drive.**

   Are the cables firmly connected?

   Yes. Go to step 9.

   No. Go to step 8.

8. **Reseat the cable connectors, replace the computer cover, reconnect the system to AC power, and turn it on.**

   Is the problem resolved?

   Yes. You have fixed the problem.

   No. Go to step 9.

9. **Turn off the system, including any attached peripherals, and disconnect all the AC power cables from their power sources. Then remove the computer cover.**

10. **Remove the tape drive. Then verify that the tape drive is configured for a unique SCSI identification (ID) number and that the tape drive's termination is enabled or disabled as appropriate.**

    See the documentation for the tape drive for instructions on selecting the SCSI ID and enabling or disabling termination.

    Is the tape drive configured correctly?

    Yes. Go to step 13.

    No. Go to step 11.

11. **Reconfigure the tape drive's SCSI ID and termination settings as appropriate. Reinstall the tape drive, replace the computer cover, reconnect the system to AC power, and turn it on.**

    Is the problem resolved?

    Yes. The tape drive was configured incorrectly. You have fixed the problem.

    No. Go to step 12.

12. **Turn off the system, including any attached peripherals, and disconnect all the AC power cables from their power sources. Then remove the computer cover.**

13. **Replace the SCSI cable that connects the tape drive to the SCSI host adapter connector.**

14. **Replace the computer cover, reconnect the system to AC power, reconnect any telephone or telecommunication lines, and turn on the computer.**

    Is the problem resolved?

    Yes. You have fixed the problem.

    No. See Chapter 7, "Getting Help," for instructions on obtaining technical assistance.

Troubleshooting Hard-Disk Drives

Hard-disk drive problems can be caused by a number of conditions, including problems with the drive itself, a hard-disk drive controller card, the optional SCSI backplane board, the SCSI host adapter, or an interface cable. This section is further subdivided into three procedures for troubleshooting hard-disk drives:

- "Troubleshooting IDE Hard-Disk Drives"
- "Troubleshooting SCSI Hard-Disk Drives in a System Without a SCSI Backplane Board"
- "Troubleshooting SCSI Hard-Disk Drives in a System With a SCSI Backplane Board"

Troubleshooting IDE Hard-Disk Drives

Use the following procedure to troubleshoot a hard-disk drive problem if your system includes one or more integrated drive electronics (IDE) hard-disk drives.

CAUTION: This troubleshooting procedure can destroy data stored on the hard-disk drive. Before you proceed, make sure you have backed up all the files on your hard-disk drive.

1. **Boot the system from a diskette, enter the System Setup program, and verify that the hard-disk drive categories are set correctly for the installed hard-disk drives.**

    Refer to your system documentation for the correct settings of these categories. You can also use the automatic drive-type detect feature to correctly set the drive-type number and the drive parameters for each drive.

    Are the system configuration settings correct for the installed hard-disk drive?

    Yes. Go to step 3.

    No. Go to step 2.

2. **Correct the system configuration settings, and reboot the system.**

    Is the problem resolved?

    Yes. The system configuration settings were set incorrectly. You have fixed the problem.

    No. Go to step 3.

3. **Turn off the system, including any attached peripherals, and disconnect all the AC power cables from their power sources. Also, disconnect any telephone or telecommunication lines from the computer.**

4. **Remove the computer cover.**

CAUTION: See "Protecting Against Electrostatic Discharge" in the safety instructions at the front of this guide.

5. **Check the hard-disk drive interface cable connections to the drive and to the IDE connector on the system board or the controller card (if one is installed). Check the DC power cable connection to the drive.**

    Are the cables firmly connected?

    Yes. Go to step 7.

    No. Go to step 6.

6. **Reseat the cable connectors, replace the computer cover, reconnect the system to AC power, and turn it on.**

    Is the problem resolved?

    Yes. The cables were loose. You have fixed the problem.

    No. Go to step 7.

7. **Turn off the system, disconnect it from AC power, and remove the computer cover.**

8. **Remove the hard-disk drive.**

9. **Check the hard-disk drive's jumpers and the controller card's jumpers (if a controller card is installed). (For an Industry-Standard Architecture [ISA] card, check the settings on the card itself; for an Extended Industry-Standard Architecture [EISA] card, check the settings through the EISA Configuration Utility.)**

   For a description of the jumper settings for the drive or controller card, see the documentation for the drive or controller card.

   Are the jumpers positioned correctly?

   Yes. Go to step 11.

   No. Go to step 10.

10. **Correct the jumper settings for the drive and/or controller card as instructed by the documentation for the drive and reinstall the hard-disk drive.**

11. **Replace the computer cover, reconnect the system to AC power, reconnect any telephone or telecommunication lines to the computer, and turn on the computer.**

12. **Listen for the drive spinning up after the power supply turns on.**

    Can you hear the drive spinning up?

    Yes. Go to step 13.

    No. Go to step 14.

13. **Partition and logically format the hard-disk drive. If possible, restore the files to the drive.**

    To partition and logically format the drive, see the documentation for the computer's operating system.

    Is the problem resolved?

    Yes. The hard-disk drive's file structure was probably corrupt. You have fixed the problem.

    No. Go to step 14.

14. **See Chapter 7, "Getting Help," for instructions on obtaining technical assistance.**

Troubleshooting SCSI Hard-Disk Drives in a System Without a SCSI Backplane Board

Use the following procedure to troubleshoot a hard-disk drive problem if your system includes one or more SCSI hard-disk drives and does *not* contain a SCSI backplane board.

CAUTION: This troubleshooting procedure can destroy data stored on the hard-disk drive. Before you proceed, make sure you have backed up all the files on your hard-disk drive.

1. **Boot the system from a diskette, and enter the System Setup program.**

   Are both of the hard-disk drive categories set to None?

   Refer to your system documentation for more information about the hard-disk drive categories.

   Yes. Go to step 3.

   No. Go to step 2.

2. **Change both categories to None, and reboot the system.**

   Is the problem resolved?

   Yes. The system configuration settings were set incorrectly. You have fixed the problem.

   No. Go to step 3.

3. **Verify that any required SCSI device drivers are installed and configured correctly.**

   If the system is using the built-in SCSI host adapter or the DASH Bus Adapter card, see the *SCSI Device Driver Installation and Configuration Guide* to determine which drivers are required and how they should be installed and configured.

   Are the required SCSI device drivers installed and configured correctly?

   Yes. Go to step 5.

   No. Go to step 4.

4. **Reinstall and/or reconfigure the required SCSI device drivers. Then reboot the system.**

   Is the problem resolved?

   Yes. You have fixed the problem.

   No. Go to step 5.

5. **Turn off the system, including any attached peripherals, and disconnect all the AC power cables from their power sources. Also, disconnect any telephone or telecommunication lines from the computer.**

6. **Remove the computer cover.**

   CAUTION: See "Protecting Against Electrostatic Discharge" in the safety instructions at the front of this guide.

7. **Check the SCSI cable connection to the drive and to the SCSI host adapter. Check the DC power cable connection to the drive.**

   Are the cables firmly connected?

   Yes. Go to step 9.

   No. Go to step 8.

8. **Reseat the cable connectors, replace the computer cover, reconnect the system to AC power, reconnect any telephone or telecommunication lines to the computer, and turn it on.**

   Is the problem resolved?

   Yes. The cables were loose. You have fixed the problem.

   No. Go to step 9.

9. **Turn off the system, disconnect it from AC power, disconnect any telephone or telecommunication lines from the computer, and remove the computer cover.**

10. **Remove the hard-disk drive.**

11. **Verify that the hard-disk drive is configured for a unique SCSI ID and that termination is enabled or disabled as appropriate.**

    See the documentation for the hard-disk drive for instructions on selecting the SCSI ID and enabling or disabling termination.

    Is the hard-disk drive configured correctly?

    Yes. Go to step 13.

    No. Go to step 12.

12. **Reconfigure the hard-disk drive's SCSI ID and termination settings as appropriate. Reinstall the hard-disk drive. Replace the computer cover, reconnect the system to AC power, and turn it on.**

    Is the problem resolved?

    Yes. The hard-disk drive was configured incorrectly. You have fixed the problem.

    No. Go to step 13.

13. **Replace the SCSI cable connecting the drive to the SCSI host adapter. Replace the computer cover, reconnect the system to AC power, reconnect any telephone or telecommunication lines to the computer.and turn it on.**

    Is the problem resolved?

    Yes. The SCSI cable was faulty. You have fixed the problem.

    No. Go to step 14.

14. **Partition and logically format the hard-disk drive. If possible, restore the files to the drive.**

    To partition and logically format the drive, see the documentation for the computer's operating system.

    Is the problem resolved?

    Yes. The hard-disk drive's file structure was probably corrupt. You have fixed the problem.

    No. Go to step 15.

15. **See Chapter 7, "Getting Help," for instructions on obtaining technical assistance.**

Troubleshooting SCSI Hard-Disk Drives in a System With a SCSI Backplane Board

Use the following procedure to troubleshoot a hard-disk drive problem if your system contains an optional SCSI backplane board.

CAUTION: This troubleshooting procedure can destroy data stored on the hard-disk drive. Before you proceed, make sure you have backed up all the files on your hard-disk drive.

1. **Boot the system from a diskette, and enter the System Setup program.**

   Are both of the hard-disk drive categories set to None?

   Yes. Go to step 3.

   No. Go to step 2.

2. **Change both categories to None, and reboot the system.**

   Is the problem resolved?

   Yes. You have fixed the problem.

   No. Go to step 3.

3. **Verify that any required SCSI device drivers are installed and configured correctly.**

   If the system is using the built-in SCSI host adapter or the DASH Bus Adapter card, see the *SCSI Device Driver Installation and Configuration Guide* to determine which drivers are required and how they should be installed and configured.

   Are the required SCSI device drivers installed and configured correctly?

   Yes. Go to step 5.

   No. Go to step 4.

4. **Reinstall and/or reconfigure the required SCSI device drivers. Then reboot the system.**

   Is the problem resolved?

   Yes. You have fixed the problem.

   No. Go to step 5.

5. **Determine whether the system has a Dell SCSI Array (DSA) controller card.**

   Does the system have a DSA controller card?

   Yes. Go to step 6.

   No. Go to step 15.

6. **Run the DSA Manager program to see if it can determine which hard-disk drive is faulty.**

   See the *Dell SCSI Array User's Guide* for instructions on running the DSA Manager.

   Can the DSA Manager identify the faulty drive?

   Yes. Go to step 26.

   No. Go to step 7.

7. **Remove the computer cover.**

   CAUTION: See "Protecting Against Electrostatic Discharge" in the safety instructions at the front of this guide.

8. **Check the hard-disk drive failure indicator on the front of each hard-disk drive carrier.**

   Is the hard-disk drive failure indicator on or blinking for any of the drive carriers?

   Yes. Go to step 26.

   No. Go to step 9.

9. **Check the online indicator on the front of each hard-disk drive carrier.**

   Is the online indicator on for each drive carrier?

   Yes. Go to step 13.

   No. Go to step 10.

10. **Press the release button on the front of the drive carrier.**

    Does the online indicator blink and then turn on?

    Yes. The drive carrier was not installed into the array. You have fixed the problem.

    No. Go to step 11.

11. **Check the SCSI ID switch settings on the back of the SCSI backplane board to verify that each drive bay is configured for a unique SCSI ID and that none of the SCSI IDs conflict with the SCSI ID for the SCSI host adapter.**

    See your system documentation for the recommended SCSI ID switch settings.

    Is the drive bay configured for a unique SCSI ID?

    Yes. Go to step 13.

    No. Go to step 12.

12. **Change the SCSI ID switch settings so that each drive bay is configured for a unique SCSI ID that does not conflict with the SCSI host adapter. Turn off the computer, wait a few seconds, then turn it back on.**

    Is the problem resolved?

    Yes. The drive bay was configured incorrectly. You have fixed the problem.

    No. Go to step 13.

> **CAUTION: Removing the jumper plug from the READ_ONLY jumper pins and then reinstalling the drive with the system turned on will cause all data on the drive to be erased. To preserve the data on the drive, either turn off the system, reinstall the drive, and then turn on the system, or do not reinstall the drive.**

13. **Remove the drive carrier from its bay, and check all cable connections between the drive and the drive carrier. Also make sure that the SCSI ID cable is oriented correctly and is installed on the correct set of pins on the drive. Reinstall the drive carrier in its bay. Verify that a jumper plug is not installed on the READ_ONLY jumper pins on the interface board. Then press the release button on the front of the drive carrier.**

    See your system documentation for information on cable connections and the correct installation of the SCSI ID cable.

    Does the online light-emitting diode (LED) blink and then stay on?

    Yes. The drive carrier was not firmly seated in the connector on the SCSI backplane board, or one of the cables in the drive carrier was installed incorrectly. You have fixed the problem.

    No. Go to step 14.

14. **Remove the drive carrier and install it in another drive bay.**

    Is the problem resolved?

    Yes. The SCSI backplane board has a defective connector. See Chapter 7, "Getting Help," for instructions on obtaining technical assistance.

    No. Go to step 21.

15. **Check the online indicator on the front of each hard-disk drive carrier.**

    Is the online indicator on for each drive carrier?

    Yes. Go to step 19.

    No. Go to step 17.

16. **Check the SCSI ID switch settings on the back of the SCSI backplane board to verify that each drive bay is configured for a unique SCSI ID and that none of the SCSI IDs conflict with the SCSI ID for the SCSI host adapter.**

    See your system documentation for the recommended SCSI ID switch settings.

    Is the drive bay configured for a unique SCSI ID?

    Yes. Go to step 19.

    No. Go to step 18.

17. **Change the SCSI ID switch settings so that each drive bay is configured for a unique SCSI ID that does not conflict with the SCSI host adapter. Turn off the computer, wait a few seconds, then turn it back on.**

    Is the problem resolved?

    Yes. The drive bay was configured incorrectly. You have fixed the problem.

    No. Go to step 19.

18. **Turn off the system, including any attached peripherals, and disconnect all the AC power cables from their power sources. Also, disconnect any telephone or telecommunication lines from the computer. Remove the computer cover if it is not already removed.**

19. **Remove a drive carrier from its bay, and check all cable connections between the drive and the drive carrier. Also make sure that the SCSI ID cable is oriented correctly and is installed on the correct set of pins on the drive. Reinstall the drive carrier in its bay. Repeat this procedure for all the other drive carriers. Reconnect the system to AC power, and turn it on.**

    See your system documentation for information on cable connections and the correct installation of the SCSI ID cable.

    Is the problem resolved?

    Yes. A drive carrier was not firmly seated in its connector on the SCSI backplane board. You have fixed the problem.

    No. Go to step 21.

20. **Turn off the system, including any attached peripherals, and disconnect all the AC power cables from their power sources.**

21. **Check the SCSI cable connections to the SCSI backplane board and to the SCSI host adapter. Check the DC power cable connection to the SCSI backplane board.**

    See your system documentation for the location of the cable connectors on the SCSI backplane board.

    Are the cables firmly connected?

    Yes. Go to step 24.

    No. Go to step 23.

22. **Reseat the cable connectors, reconnect the computer and peripherals to their AC power sources, and turn them on.**

    Is the problem resolved?

    Yes. The cable connections were faulty. You have fixed the problem.

    No. Go to step 24.

23. **Turn off the system, including any attached peripherals, and disconnect all the AC power cables from their power sources.**

24. **Replace the SCSI cable connecting the SCSI backplane board to the SCSI host adapter. Reconnect the system to AC power, and turn it on.**

    Is the problem resolved?

    Yes. The SCSI cable was faulty. You have fixed the problem.

    No. Go to step 26.

25. **Partition and logically format the hard-disk drive. If possible, restore your files to the drive.**

    To partition and logically format the drive, see the documentation for the computer's operating system.

    Is the problem resolved?

    Yes. The hard-disk drive format was corrupted. You have fixed the problem.

    No. Go to step 26.

26. **See Chapter 7, "Getting Help," for instructions on obtaining technical assistance.**

Chapter 7
Getting Help

This chapter describes the tools Dell provides to help you when you have a problem with your computer system. It also tells you when and how to call Dell for technical or customer assistance in the following situations:

- *If you have a technical problem*, read the next section, "Technical Assistance."
- *If you are looking for information about a specific subject or about Dell's services*, read "Help Tools" found later in this chapter.
- *If you have a problem with your order*, read "Problems With Your Order" found later in this chapter.
- *If you need to return an item for warranty repair or credit*, read "Returning Items for Warranty Repair or Credit" found later in this chapter.
- *If you would like to place an order or need information about additional products available from Dell*, call Dell at the appropriate telephone number listed in "Dell Contact Numbers" found later in this chapter.

Technical Assistance

If you need assistance with a technical problem, perform the following steps:

1. **Review the *Frequently Asked Questions* cards, if applicable.**

   Two information cards, one titled *Frequently Asked Questions About Your Dell System* and another titled *Frequently Asked Questions About MS-DOS and Microsoft Windows*, come with certain Dell systems.

   NOTE: You may also find these questions and answers in the Dell Q&A *for certain systems. For more information, see "Dell Q&A" found later in this chapter.*

2. **Review the remaining documentation that accompanied your Dell system.**

   To decide which document has the answers you need, consult the Preface of your system documentation.

3. **Run the diagnostics for your Dell system.**

   See Chapter 4, "Running the Dell Diagnostics," for instructions on using the Dell Diagnostics program.

4. **Make a copy of the Diagnostics Checklist (found later in this chapter), and fill it out.**

   NOTE: Save the Diagnostics Checklist in this chapter as a master so you can use it to make copies as needed.

   On your copy of the Diagnostics Checklist, document any error messages or beep codes as they occur so you can inform the Dell technician of them. Describe what you were doing when the error occurred. Note the steps you have taken to solve the problem.

5. **Use the AutoTech service for help with installation and troubleshooting procedures.**

   For instructions on using the AutoTech service, see "AutoTech Service" found later in this chapter

6. **If the preceding steps have not resolved the problem and you need to talk to a Dell technician, you can call Dell's customer technical support service.**

   Before you call Dell, convert your service tag number into an express service code. When prompted by Dell's automated telephone system, enter the express service code to route your call directly to the proper support personnel.

If you did not convert your service tag number to an express service code the first time you turned on the system, do it before you call Dell for technical assistance. Find the Express Service Code icon in the Dell Accessories folder or program group. Double-click the icon and follow the directions.

NOTE: Dell's Express Service may not be available in all countries.

For instructions on using the technical support service, see "Technical Support Service" and "Before You Call" found later in this chapter.

Help Tools

Dell provides a number of tools to assist you. Table 7-1 lists subjects you may want information about, tasks you may want to perform, and the tool(s) you can use for help. Each tool is described later in this section.

Table 7-1. Help Tools

Subject or Task	Tool
BIOS revisions	TechConnect BBS
Frequently asked questions	*Frequently Asked Questions* cards, *Dell Q&A*, AutoTech service
Information about Dell, its products, and its service and support policies	TechFax service, TechConnect BBS, World Wide Web on the Internet
Installation instructions	System documentation, technical support service, AutoTech service
Interrupt maps	TechFax service
Ordering parts	Technical support service, TechConnect BBS
Software update information	TechFax service
System board layouts	TechFax service, system documentation
Technical notes on system compatibility and revisions	TechFax service
Technical training class information	TechFax service
Technical specifications	TechFax service, system documentation
Troubleshooting, step-by-step instructions	System documentation, Dell Diagnostics program, AutoTech service
Unresolved problems requiring assistance from a Dell technician	Technical support service, TechConnect BBS

NOTE: For the full name of an abbreviation or acronym used in this table, see the abbreviations and acronyms list that precedes the Index.

Frequently Asked Questions Cards

Dell anticipates some of your questions by providing two information cards with certain Dell systems. One card is

titled *Frequently Asked Questions About Your Dell System* and the other is titled *Frequently Asked Questions About MS-DOS and Microsoft Windows*. Be sure to review these cards when you have a question about your system, MS-DOS, or the Windows 3.*x* or Windows 95 operating system.

Dell Q&A

The *Dell Q&A*, a Windows-based online help file that answers questions that are often asked by Dell computer users, is included with certain Dell systems that were purchased with the Dell-installed Windows 3.*x* or Windows 95 operating system.

To view the *Dell Q&A*, open the Dell Accessories program group or folder and double-click on the Dell Q&A icon. If you need further instructions on using the *Dell Q&A*, click Help from the *Dell Q&A* button bar.

System Documentation

The system documentation shipped with your system includes information about installing hardware, software support utilities, and video drivers and about using the System Setup program. For certain Dell systems, the system documentation is provided online and is located in the Dell Accessories program group or folder.

World Wide Web on the Internet

Dell can be accessed electronically on the Internet via a World Wide Web site, a file transfer protocol (FTP) site, and electronic mail (e-mail) using the following addresses:

- World Wide Web

  http://www.dell.com/

  http://www.dell.com/intl/apcc/ (for Asian/Pacific countries only)

  http://www.dell.com/euro/ (for Europe only)

- Anonymous FTP

  ftp.dell.com/

  Log in as `user: anonymous`, and use your e-mail address as your password.

- Electronic Support Service

  support@us.dell.com

  apsupport@dell.com (for Asian/Pacific countries only)

- Electronic Quote Service

  sales@dell.com

  apmarketing@dell.com (for Asian/Pacific countries only)

- Electronic Information Service

  info@dell.com

Commercial Online Service

Dell can be accessed electronically via CompuServe® by typing `GO DELL`.

Dell Diagnostics Program

Every Dell system comes with the Dell Diagnostics, a program that can help you determine what is wrong with the system when it does not operate correctly. This program provides valuable information for you and for Dell technicians should you need to call Dell.

See Chapter 4, "Running the Dell Diagnostics," for instructions on using the diagnostics. You can use this diagnostic program to test major components or devices in the system, if the system can boot.

AutoTech Service

Dell's automated technical support service—AutoTech—provides recorded answers to the questions most frequently asked by Dell customers.

When you call AutoTech, you use your touch-tone telephone to select the subjects that correspond to your questions. You can even interrupt an AutoTech session and continue the session later. The code number that the AutoTech service gives you allows you to continue your session where you ended it.

The information available through AutoTech includes:

- Specifications and prices for Dell systems currently on sale
- Installation instructions for Dell systems and peripherals

- Answers to questions about MS-DOS and the Microsoft Windows 95 and Windows 3.*x* operating systems
- Help in troubleshooting your Dell system

The AutoTech service is available 24 hours a day, seven days a week. You can also access this service through the technical support service. For the telephone number to call, see “Dell Contact Numbers” found later in this chapter.

NOTE: AutoTech is not always available in all locations outside the continental U.S. Please call your local Dell representative for information on availability.

TechFax Service

Dell takes full advantage of fax technology to serve you better. Twenty-four hours a day, seven days a week, you can call the Dell TechFax line toll-free for all kinds of technical information.

Using a touch-tone phone, you can select from a full directory of topics. The technical information you request is sent within minutes to the fax number you designate. TechFax information includes:

- Interrupt maps, system board layouts, and specifications.
- Technical notes on system compatibility and revisions.
- News on updates for operating systems and application programs.
- Descriptions of available technical training classes. For Dell-certified technicians, TechFax offers information such as parts lists, drawings, and maintenance and repair data.

For the TechFax telephone number, see “Dell Contact Numbers” found later in this chapter.

NOTE: TechFax is not always available in all locations outside the continental U.S. Please call your local Dell representative for information on availability.

TechConnect BBS

Use your modem to access Dell’s TechConnect Bulletin Board Service (BBS) 24 hours a day, seven days a week. The service is menu-driven and fully interactive. The modem settings for the BBS are 8 bit, no parity, 1 stop bit.

You can use the BBS to do the following:

- Send questions to a Dell technician
- Request a follow-up call or leave a message for a Dell technical support specialist
- Order parts
- Download basic input/output system (BIOS) and video driver upgrades
- Download updates

For the BBS telephone number, see “Dell Contact Numbers” found later in this chapter.

NOTE: The TechConnect BBS is not always available in all locations outside the continental U.S. Please call your local Dell representative for information on availability.

Automated Order-Status System

You can call this automated service to check on the status of any Dell products that you have ordered. A recording prompts you for the information needed to locate and report on your order. For the telephone number to call, see “Dell Contact Numbers” found later in this chapter.

NOTE: The Automated Order-Status System is not always available in all locations outside the continental U.S. Please call your local Dell representative for information on availability.

Technical Support Service

Dell’s industry-leading hardware technical support service is open 24 hours a day, seven days a week. At any hour of any day, a Dell technical expert is ready with the answers to your questions about Dell hardware.

Our technical support staff pride themselves on their track record: more than 90 percent of all problems and questions are taken care of in just one toll-free call, usually in less than ten minutes. When you call, our experts can refer to records we keep on your specific Dell system to better understand your particular question. Our technical support staff use computer-based diagnostics to provide fast, accurate answers to your questions.

To contact Dell's technical support service, first refer to the section titled "Before You Call" and then call the number for your country as listed in "Dell Contact Numbers" found later in this chapter. (For information about receiving technical assistance in the U.K., refer to the *Placing a Service Call* card that came with your system.)

NOTE: Technical support services may vary outside the continental U.S. Contact your local Dell representative for more information.

Problems With Your Order

If you have a problem with your order, such as missing parts, wrong parts, or incorrect billing, contact Dell Computer Corporation for customer assistance. Have your invoice or packing slip handy when you call. For the telephone number to call, see "Dell Contact Numbers" found later in this chapter.

Product Information

If you need information about additional products available from Dell Computer Corporation, or if you would like to place an order, a sales specialist will be glad to help. For the telephone number to call, see "Dell Contact Numbers" found later in this chapter.

Returning Items for Warranty Repair or Credit

Prepare all items being returned, whether for repair or credit, as follows:

1. **Call Dell to obtain an authorization number, and write it clearly and prominently on the outside of the box.**

   For the telephone number to call, see "Dell Contact Numbers" found later in this chapter.

2. **Include a copy of the invoice and a letter describing the reason for the return.**
3. **Include a copy of the Diagnostics Checklist indicating the tests you have run and any error messages reported by the Dell Diagnostics.**
4. **Include any accessories that belong with the item(s) being returned (power cables, software diskettes, guides, and so on) if the return is for credit.**
5. **Pack the equipment to be returned in the original (or equivalent) packing materials.**

   You are responsible for paying shipping expenses. You are also responsible for insuring any product returned, and you assume the risk of loss during shipment to Dell Computer Corporation. Collect on delivery (C.O.D.) packages are not accepted.

Returns that are missing any of the preceding requirements will be refused at our receiving dock and returned to you.

Before You Call

Keep a record of your diagnostic and troubleshooting activities by photocopying the Diagnostics Checklist in Figure 7-1 and filling it out whenever you experience a problem with the system.

NOTE: Be sure to save the checklist in Figure 7-1 as a master, so you can use it to make copies as needed. The checklist can also be accessed in "Diagnostics Checklist" in the online System User's Guide.

If you need to call Dell Computer Corporation for assistance, you will be able to inform the support technician of the actions you have taken to resolve the problem. If you must return a piece of hardware to Dell, a technician will assign a Return Material Authorization Number. Record the number on the checklist, and include the completed checklist in the shipping box.

Dell's technical support staff uses computer-based diagnostics to provide fast, accurate answers to your questions. When you call, the technical support staff refers to records regarding your specific Dell system to better understand your particular question.

NOTE: Have your express service code ready when you call. The code helps Dell's automated support telephone system direct your call more efficiently.

If possible, turn your system on before you call Dell for technical assistance and call from a telephone at or near the system. You may be asked to type some commands at the keyboard, relay detailed information during operations, or try other troubleshooting steps possible only at the system itself.

Make sure the system's user documentation is available. You should also have a flat-blade screwdriver or a quarter-inch nut driver available.

WARNING: If you need to remove the computer cover, be sure to first disconnect the computer system's power and modem cables from all electrical outlets.

Diagnostics Checklist

Name: ______________________________ Date: ______________

Address: ______________________________ Phone number: ______________

Service tag (bar code on the back of the computer): ______________________________

Express service code: ______________________________

Return Material Authorization Number (if provided by Dell support technician): ______________

Operating system and version: ______________________________

Peripherals: ______________________________

____

____

PC Cards or expansion cards: ______________________________

____

____

Are you connected to a network? ☐ yes ☐ no

Network, version, and network card: ______________________________

Programs and versions: ______________________________

____

____

____

See your operating system documentation to determine the contents of the system's start-up files. If the computer is connected to a printer, print each file. Otherwise, record the contents of each file before calling Dell.

Error message or beep code: ______________________________

Description of problem and troubleshooting procedures you performed: ______________

____

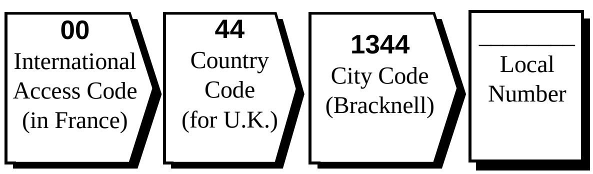
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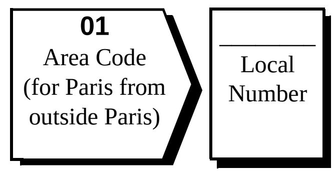
Figure 7-1. Diagnostics Checklist

Dell Contact Numbers

When you need to contact Dell, use the telephone numbers and codes provided in Tables 7-2 and 7-3. Table 7-2 provides the various codes required to make long-distance and international calls. Table 7-3 provides local telephone numbers, area codes, and toll-free numbers, if applicable, for each department or service available in various countries around the world. If you are making a direct-dialed call to a location outside of your local telephone service area, determine which codes to use (if any) in Table 7-2 in addition to the local numbers provided in Table 7-3. For example, to place an international call from Paris, France, to Bracknell, England, dial the international access code for France followed by the country code for the U.K., the city code for Bracknell, and then the local number as shown in the following illustration.



To place a long-distance call within your own country, use area codes instead of international access codes, country codes, and city codes. For example, to call Paris, France from Montpellier, France, dial the area code plus the local number as shown in the following illustration.



The codes required depend on where you are calling from as well as the destination of your call; in addition, each country has a different dialing protocol. If you need assistance in determining which codes to use, contact a local or an international operator.

NOTE: Toll-free numbers are for use only within the country for which they are listed. Area codes are most often used to call long distance within your own country (not internationally)—in other words, when your call originates in the same country you are calling.

Table 7-2. International Dialing Codes

Country (City)	International Access Code	Country Code	City Code
Australia (Sydney)	0011	61	2
Austria (Vienna)	900	43	1
Belgium (Brussels)	00	32	2
Brunei	—	673	—
Canada (North York, Ontario)	011	—	Not required
Chile (Santiago)	—	56	2
China (Beijing)	—	86	10
Czech Republic (Prague)	00	420	2
Denmark (Horsholm)	009	45	Not required
Finland (Helsinki)	990	358	9
France (Paris) (Montpellier)	00	33	(1) (4)
Germany (Langen)	00	49	6103
Hong Kong	001	852	Not required
Ireland (Bray)	16	353	1
Italy (Milan)	00	39	2
Japan (Kawasaki)	001	81	44
Korea (Seoul)	001	82	2
Luxembourg	00	352	—
Macau	—	853	Not required
Malaysia (Penang)	00	60	4
Mexico (Colonia Granada)	95	52	5
Netherlands (Amsterdam)	00	31	20
New Zealand	00	64	—
Norway (Lysaker)	095	47	Not required
Poland (Warsaw)	011	48	22
Singapore (Singapore)	005	65	Not required
South Africa (Johannesburg)	09/091	27	11

Table 7-2. International Dialing Codes (continued)

Country (City)	International Access Code	Country Code	City Code
Spain (Madrid)	07	34	1
Sweden (Upplands Vasby)	009	46	8
Switzerland (Geneva)	00	41	22
Taiwan	002	886	—
Thailand	001	66	—
U.K. (Bracknell)	010	44	1344
U.S.A. (Austin, Texas)	011	1	Not required

Table 7-3. Dell Contact Numbers

Country (City)	Department Name or Service	Area Code	Local Number or Toll-Free Number
Australia (Sydney)	Customer Technical Support (Dell Dimension® systems only)		1-300-65-55-33
	Customer Technical Support (Other systems)		toll free: 1-800-808-378
	Customer Care		toll free: 1-800-819-339
	Corporate Sales		toll free: 1-800-808-385
	Transaction Sales		toll free: 1-800-808-312
	Fax		toll free: 1-800-818-341
Austria* (Vienna)	Switchboard		491 04 0
	Technical Support		0660-8779
Belgium* (Brussels)	Customer Technical Support	02	4819288
	Sales		toll free: 0800 16884
	SalesFax	02	4819299
	Switchboard	02	4819100
	Fax	02	4819299

* *For technical assistance in this country after normal working hours, use one of the following numbers: (353-1) 204 4008 or (353-1) 286 5908 (English only—the call is rerouted to the U.S.A.).*

Table 7-3. Dell Contact Numbers *(continued)*

Country (City)	Department Name or Service	Area Code	Local Number or Toll-Free Number
Brunei *NOTE: Customers in Brunei call Malaysia for sales, customer, and technical assistance.*	Customer Technical Support (Dell Dimension systems only) (Penang, Malaysia)		810 4946
	Customer Technical Support (Other systems) (Penang, Malaysia)		810 4966
	Customer Service (Penang, Malaysia)		810 4949
	Transaction Sales (Penang, Malaysia)		810 4955
Canada (North York, Ontario) *NOTE: Customers in Canada call the U.S.A. for access to TechConnect BBS.*	Automated Order-Status System		toll free: 1-800-433-9014
	AutoTech (Automated technical support)		toll free: 1-800-247-9362
	Customer Care (From outside Toronto)		toll free: 1-800-387-5759
	Customer Care (From within Toronto)	416	758-2400
	Customer Technical Support		toll free: 1-800-847-4096
	Sales (Direct Sales—from outside Toronto)		toll free: 1-800-387-5752
	Sales (Direct Sales—from within Toronto)	416	758-2200
	Sales (Federal government, education, and medical)		toll free: 1-800-567-7542
	Sales (Major Accounts)		toll free: 1-800-387-5755
	TechConnect BBS (Austin, Texas, U.S.A.)	512	728-8528
	TechFax		toll free: 1-800-950-1329
Chile (Santiago) *NOTE: Customers in Chile call the U.S.A for sales, customer, and technical assistance.*	Sales, Customer Support, and Technical Support		toll free: 1230-020-4823
China (Beijing) *NOTE: Customers in China call Malaysia for customer assistance.*	Customer Service (Penang, Malaysia)		810 4949
	Sales		6846 1122 (extensions 8309 to 8314)

Table 7-3. Dell Contact Numbers *(continued)*

Country (City)	Department Name or Service	Area Code	Local Number or Toll-Free Number
Czech Republic* (Prague)	Technical Support	02	8728 221
	Customer Service and Sales	02	879250
	TechConnect BBS	02	66710274
Denmark* (Horsholm)	Customer Care, Technical Support, and Sales		toll free: 800 171 62
Finland* (Helsinki)	Customer Support and Technical Support		toll free: 0800-534 55
	Sales		toll free: 0800-33 55
France* (Paris/Montpellier)	Technical Support (Paris)	01	47 62 68 90
	Technical Support (Montpellier)	04	67 06 62 86
	Customer Care (Major Accounts) (Paris)	01	47 62 69 39
	Customer Care (VAR Accounts) (Paris)	01	47 62 69 26
	Customer Care (Direct Sales) (Paris)	01	47 62 69 76
	TechFax (Montpellier)	04	67 22 53 11
	TechConnect BBS (Montpellier)	04	67 22 53 04
	Switchboard (Paris)	01	47 62 68 50
	Switchboard (Montpellier)	04	67 06 65 51
Germany* (Langen)	Customer Technical Support	06103	971-200
	Customer Care	06103	971-500
	TechConnect BBS	06103	971-666
	Sales	06103	971-460
Hong Kong *NOTE: Customers in Hong Kong call Malaysia for technical assistance for Dell Dimension systems and for customer assistance.*	Technical Support (Dell Dimension systems only) (Penang, Malaysia)		810 4948
	Technical Support (Other systems)		toll free: 800 96 4107
	Customer Service (Penang, Malaysia)		810 4949
	Transaction Sales		toll free: 800 96 4109
	Corporate Sales		toll free: 800 96 4108

* *For technical assistance in this country after normal working hours, use one of the following numbers: (353-1) 204 4008 or (353-1) 286 5908 (English only—the call is rerouted to the U.S.A.).*

Table 7-3. Dell Contact Numbers *(continued)*

Country (City)	Department Name or Service	Area Code	Local Number or Toll-Free Number
Ireland* (Bray)	Customer Technical Support		1-850-543-543
	Sales		1-850-235-235
	SalesFax	01	286 2020
	Fax	01	286 6848
	TechConnect BBS	01	204 4761
	TechFax	01	204 4044
	Switchboard	01	286 0500
Italy* (Milan)	Switchboard		264 21 820
	Fax		264 13 420
Japan (Kawasaki)	Technical Support		toll free: 0088-22-7890
	Customer Care	044	556-4240
	Direct Sales	044	556-3344
	Commercial Sales	044	556-3430 556-3440
	Switchboard	044	556-4300
Korea (Seoul) *NOTE: Customers in Korea call Malaysia for customer assistance.*	Technical Support		toll free: 080-200-3800
	Transaction Sales		toll free: 080-200-3600
	Corporate Sales		toll free: 080-200-3900
	Customer Service (Penang, Malaysia)		810 4949
	Fax		394 3122
	Switchboard		287 5600

* *For technical assistance in this country after normal working hours, use one of the following numbers: (353-1) 204 4008 or (353-1) 286 5908 (English only—the call is rerouted to the U.S.A.).*

Table 7-3. Dell Contact Numbers *(continued)*

Country (City)	Department Name or Service	Area Code	Local Number or Toll-Free Number
Latin America	Customer Technical Support (Austin, Texas, U.S.A.)	512	728-4093
NOTE: Customers in Latin America call the U.S.A. for sales, customer, and technical assistance.	Customer Service (Austin, Texas, U.S.A.)	512	728-3619
	Fax (Technical Support and Customer Service) (Austin, Texas, U.S.A.)	512	728-3883
	Sales (Austin, Texas, U.S.A.)	512	728-4397
	SalesFax (Austin, Texas, U.S.A.)	512	728-4600
			728-3772
Luxembourg*	Customer Technical Support (Brussels, Belgium)		toll free: 0800 2109
NOTE: Customers in Luxembourg may call Belgium for sales, customer, and technical assistance as well as the SalesFax service, and they call the Netherlands for the TechFax and TechConnect BBS services.	Customer Service (Luxembourg)		295151
	Customer Service (Brussels, Belgium)	02	481 92 99
	SalesFax (Brussels, Belgium)	02	481 92 44
	TechFax (Amsterdam, Netherlands)		682 91 06
	TechConnect BBS (Amsterdam, Netherlands)		686 65 04
Macau	Technical Support (Dell Dimension systems only) (Penang, Malaysia)		810 4948
NOTE: Customers in Macau call Malaysia for technical assistance for Dell Dimension systems and for customer assistance.	Technical Support (Other systems)		toll free: 0800 582
	Customer Service (Penang, Malaysia)		810 4949
	Transaction Sales		toll free: 0800 581
Malaysia (Penang)	Technical Support (Dell Dimension systems only)	04	810 4946
	Technical Support (Other systems)		toll free: 1 800 888 298
	Customer Service	04	810 4949
	Transaction Sales		toll free: 1 800 888 202
	Corporate Sales		toll free: 1 800 888 213

* *For technical assistance in this country after normal working hours, use one of the following numbers: (353-1) 204 4008 or (353-1) 286 5908 (English only—the call is rerouted to the U.S.A.).*

Table 7-3. Dell Contact Numbers (continued)

Country (City)	Department Name or Service	Area Code	Local Number or Toll-Free Number
Mexico (Colonia Granada)	Automated Order-Status System (Austin, Texas, U.S.A.)	512	728-0685
NOTE: Customers in Mexico call the U.S.A. for access to the Automated Order-Status System and AutoTech.	AutoTech (Automated technical support) (Austin, Texas, U.S.A.)	512	728-0686
	Customer Technical Support	525	228-7870
	Sales	525	228-7811
			toll free: 91-800-900-37
			toll free: 91-800-904-49
	Customer Service	525	228-7878
	Main	525	228-7800
Netherlands* (Amsterdam)	Customer Technical Support	020	5818838
	Direct Sales		toll free: 0800-0663
	Direct SalesFax	020	682 7171
	Corporate Sales	020	581 8818
	Corporate SalesFax	020	686 8003
	TechConnect BBS	020	686 6504
New Zealand	Technical Support (Dell Dimension systems only) ($2.50 + GST per call)		0900 51010
	Technical Support (Other systems)		0800 446 255
	Customer Service		0800 444 617
	Sales		0800 441 567
	Fax		0800 441 566
Norway* (Lysaker)	Customer Technical Support and Customer Service		22-67 50 00
	Sales		67-125 711
Poland* (Warsaw)	Switchboard		620-7898
	Fax		620-4584

* *For technical assistance in this country after normal working hours, use one of the following numbers: (353-1) 204 4008 or (353-1) 286 5908 (English only—the call is rerouted to the U.S.A.).*

Table 7-3. Dell Contact Numbers *(continued)*

Country (City)	Department Name or Service	Area Code	Local Number or Toll-Free Number
Singapore (Singapore)	Technical Support (Dell Dimension systems only) (Penang, Malaysia)	04	810 4947
NOTE: Customers in Singapore call Malaysia for technical assistance for Dell Dimension systems and for customer assistance.	Technical Support (Other systems)		toll free: 800 6011 051
	Customer Service (Penang, Malaysia)	04	810 4949
	Transaction Sales		toll free: 800 6011 054
	Corporate Sales		toll free: 800 6011 053
South Africa (Johannesburg)	Switchboard	011	709 7700
	Technical Support	011	709 7710
	Fax	011	706 0495
Southeast Asian/ Pacific Countries (excluding Australia, Brunei, China, Hong Kong, Japan, Korea, Macau, Malaysia, New Zealand, Singapore, Taiwan, and Thailand—see individual listings for these countries)	Customer Technical Support, Customer Service, and Sales (Penang, Malaysia)		60 4 810-4810
Spain* (Madrid)	Technical Support	91	902 100 130
	Customer Service	91	329 10 80
	TechConnect BBS	91	329 33 53
	Sales	91	902 100 185
	Switchboard	91	722 92 00
Sweden* (Upplands Vasby)	Technical Support	08	590 05 199
	Customer Care	08	590 05 169
	TechConnect BBS	08	590 05 591
	Sales	08	590 05 185

* *For technical assistance in this country after normal working hours, use one of the following numbers: (353-1) 204 4008 or (353-1) 286 5908 (English only—the call is rerouted to the U.S.A.).*

Table 7-3. Dell Contact Numbers (continued)

Country (City)	Department Name or Service	Area Code	Local Number or Toll-Free Number
Switzerland* (Geneva)	Technical Support		0844 811 411
	Commercial Services	022	799 01 01
	Customer Service	022	799 01 50
	Fax	022	799 01 90
Taiwan	Technical Support		toll free: 0080 651 226/0800 33 557
NOTE: Customers in Taiwan call Malaysia for customer assistance.	Customer Service (Penang, Malaysia)		810 4949
	Transaction Sales		toll free: 0080 651 228/0800 33 556
	Corporate Sales		toll free: 0080 651 227/0800 33 555
Thailand	Technical Support		toll free: 0880 060 07
NOTE: Customers in Thailand call Malaysia for customer assistance.	Customer Service (Penang, Malaysia)		810 4949
	Sales		toll free: 0880 060 06
U.K.* (Bracknell)	Customer Technical Support (Dell Dimension systems)	01344	720111
	Customer Technical Support (Other systems)	01344	723723
	Customer Care	01344	720110
	TechFax	01344	723178
	TechConnect BBS	01344	723858
	Sales	01344	720000

* *For technical assistance in this country after normal working hours, use one of the following numbers: (353-1) 204 4008 or (353-1) 286 5908 (English only—the call is rerouted to the U.S.A.).*

Table 7-3. Dell Contact Numbers (continued)

Country (City)	Department Name or Service	Area Code	Local Number or Toll-Free Number
U.S.A. (Austin, Texas)	Automated Order-Status System		toll free: 1-800-433-9014
	AutoTech (Automated technical support)		toll free: 1-800-247-9362
	Customer Technical Support (Desktops) (Return Material Authorization Numbers—warranty repairs)		toll free: 1-800-624-9896
	Customer Technical Support (Server Hotline) (Return Material Authorization Numbers—warranty repairs)		toll free: 1-800-967-1068
	Dell Customer Service (Credit Return Authorization Numbers)		toll free: 1-800-624-9897
	Dell Sales		toll free: 1-800-247-4618
	DellWare®		toll free: 1-800-753-7201
	DellWare FaxBack Service	512	728-1681
	Fee-Based Technical Support		toll free: 1-800-433-9005
	Sales (Catalogs)		toll free: 1-800-426-5150
	Spare Parts Sales:		
	Dell Direct[1]		toll free: 1-800-274-1490
	Major Accounts[2]		toll free: 1-800-357-3355
	Fax		toll free: 1-800-727-8320
	TechFax		toll free: 1-800-950-1329
	TechConnect BBS	512	728-8528
	Switchboard	512	338-4400

[1] *Use this telephone number if your call is about a system purchased for home, personal, or small-business use.*

[2] *Use this number if you are calling for an established Dell national account (have your account number handy), if you work for a governmental agency (local, state, or federal), or if you work for an educational or medical institution.*

Appendix A
Diagnostic Video Tests

The Video Test Group of the Dell Diagnostics consists of the following seven tests, each of which verifies a particular video function or group of functions:

- Video Memory Test — Checks the integrity of characters generated from data in the video memory
- Video Hardware Test — Checks the functions of the cursor register and the horizontal and vertical retrace bit registers
- Text Mode Character Test — Checks the video subsystem's ability to present text mode data
- Text Mode Color Test — Checks the video subsystem's ability to present color in text modes
- Text Mode Pages Test — Checks the video subsystem's ability to map and present all available video text pages on the monitor screen, one page at a time
- Graphics Mode Test — Checks the video subsystem's ability to present graphics mode data and colors
- Color Palettes Test — Checks the video subsystem's ability to display all available colors
- Solid Colors Test — Checks the video subsystem's ability to show screens full of solid colors. Allows you to check for missing color subpixels.

All of these tests, except the Video Memory Test and the Video Hardware Test, are interactive. These interactive tests display images on the monitor screen and require the user to respond with the following steps:

1. **Examine a displayed image for correctness.**
2. **If an image is correct, type** `y`**.**
3. **If an image is incorrect, type** `n`**.**

The following sections describe each of the tests in the Video Test Group.

Video Memory Test

The Video Memory Test verifies the integrity of the video memory either on the system board or on a video expansion card. As the test runs, it describes which 64-kilobyte (KB) block of video memory is being tested. When a test is complete, a message indicates whether the video memory has passed or failed the test. This test does not require any interaction on your part.

Video Hardware Test

The Video Hardware Test verifies the operation of the cursor registers and the horizontal and vertical retrace bit registers. When a test is complete, a message indicates whether these registers have passed or failed the test. This test does not require any interaction on your part.

Text Mode Character Test

The Text Mode Character Test consists of a group of subtests that display printable characters and character attributes. The subtests check character quality and the monitor's ability to display the characters correctly on its screen. A prompt at the bottom of each screen asks the user to decide whether the display is satisfactory and to respond by typing `y` or `n`.

If you respond affirmatively to each subtest, the Text Mode Character Test passes. A negative response to any subtest causes the test to fail.

The following subsections describe the subtests of the Text Mode Character Test in the order in which they appear.

Character Attributes Subtest (80 x 25)

The 80-column x 25-line character attributes subtest displays four lines of text that demonstrate normal-intensity video, reverse video, intensified video, and blinking video. Figure A-1 shows an example of the 80-column x 25-line character attributes subtest screen.

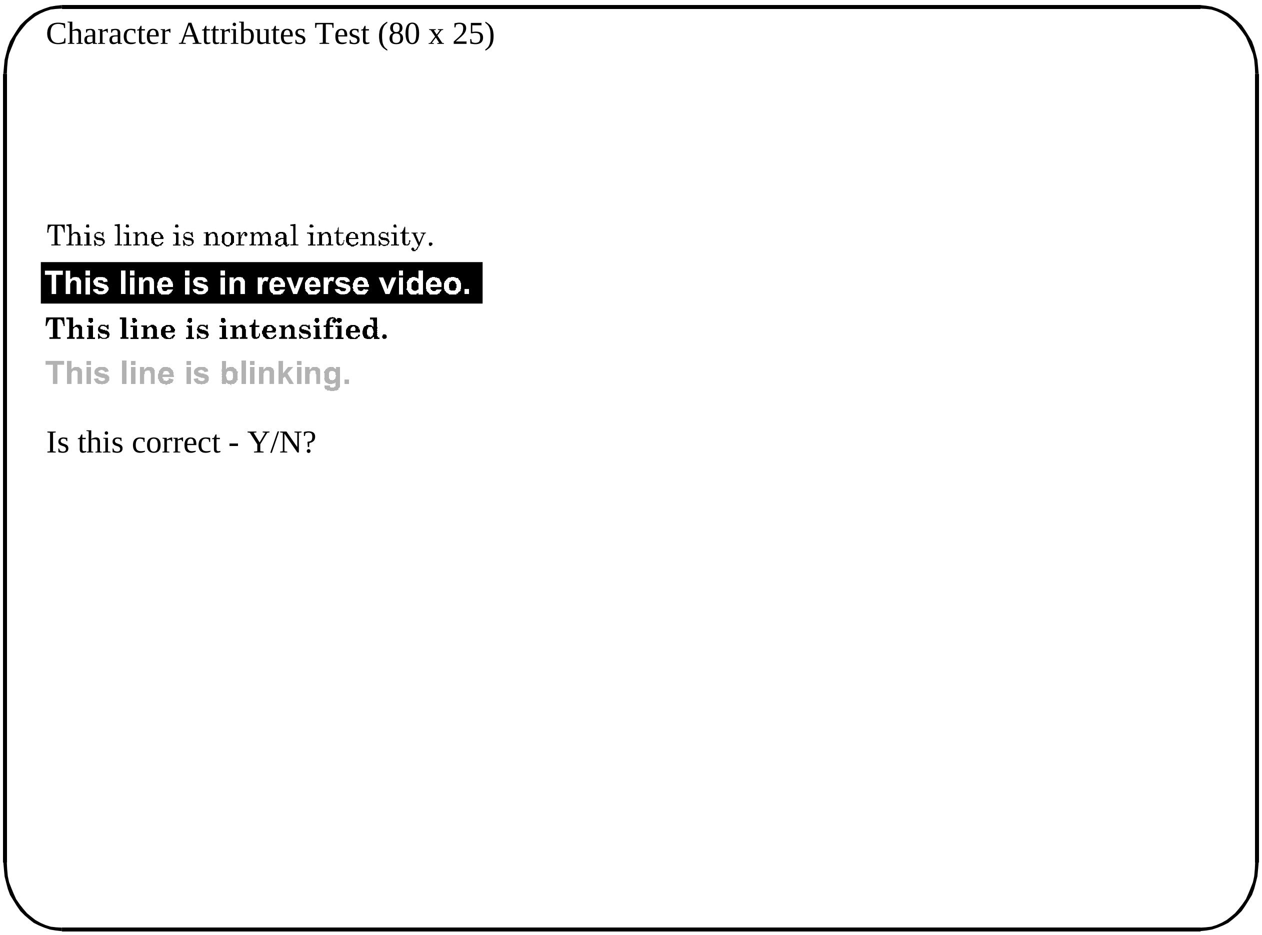


Figure A-1. 80-Column x 25-Line Character Attributes Subtest Screen

Character Set Subtest (80 x 25)

The 80-column x 25-line character set subtest displays all 256 characters in the American Standard Code for Information Interchange (ASCII) character set in 80-column by 25-line text mode. Figure A-2 shows an example of the character set subtest screen.

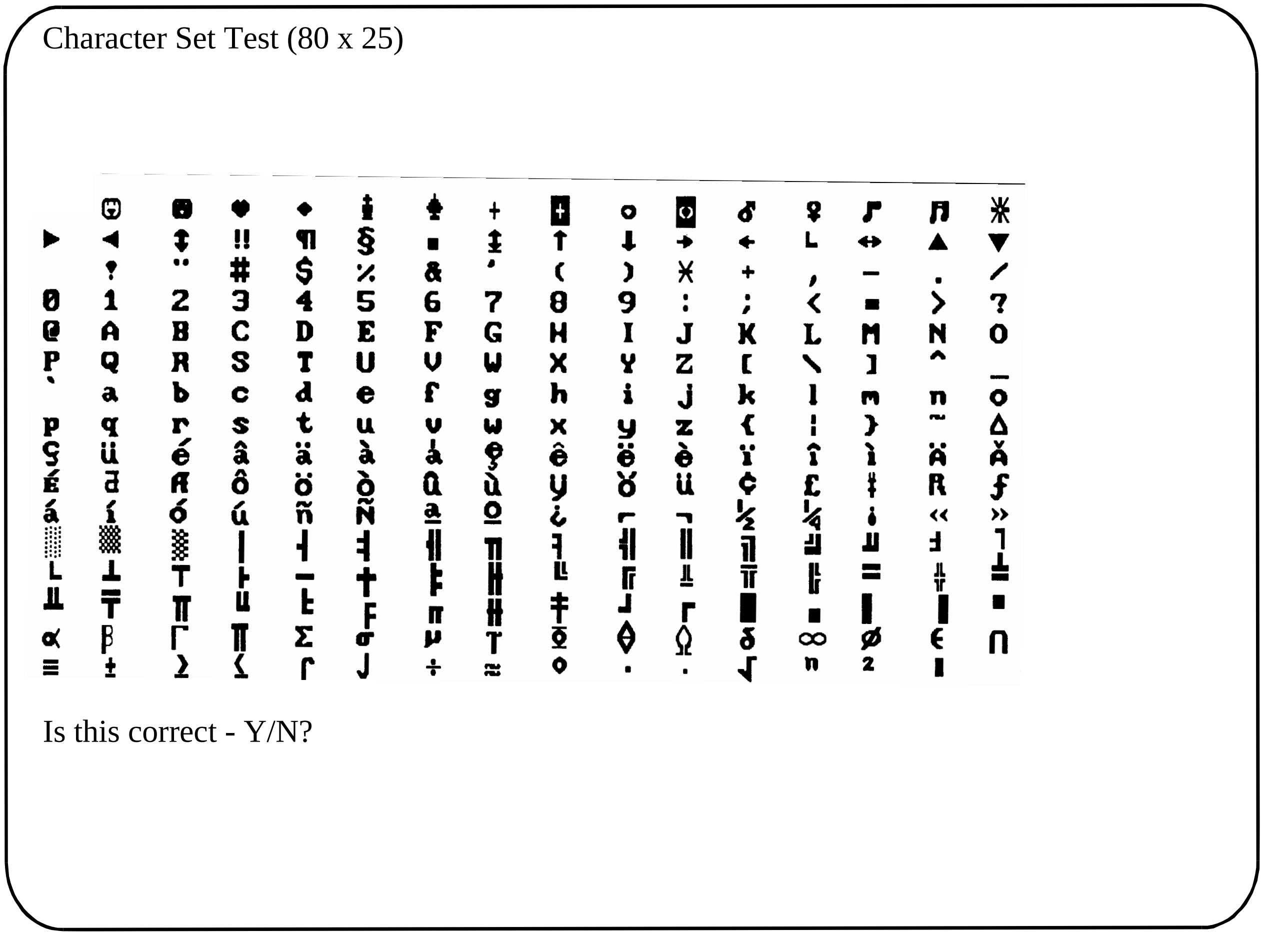


Figure A-2. 80-Column x 25-Line Character Set Subtest Screen

Video Scan Alignment Subtest

The video scan alignment subtest displays two successive screens: The first screen is a pattern of horizontal and vertical lines, which should be straight and evenly spaced. The second screen is a pattern of boxes (arranged in columns and rows), which should have straight borders and be evenly spaced. Figures A-3 and A-4, respectively, show examples of the first and second video scan alignment subtest screens.

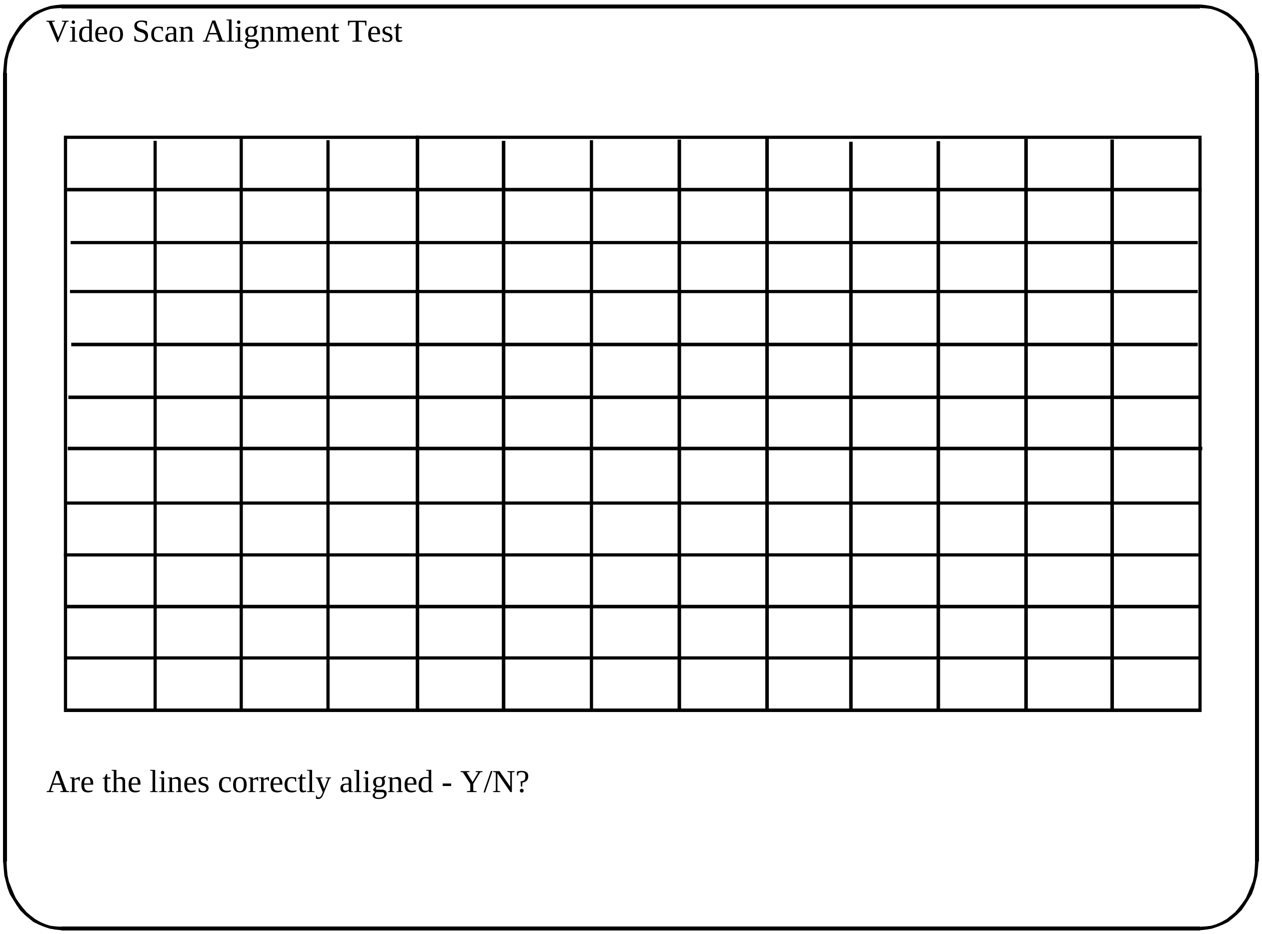


Figure A-3. Video Scan Alignment Subtest (Screen 1)

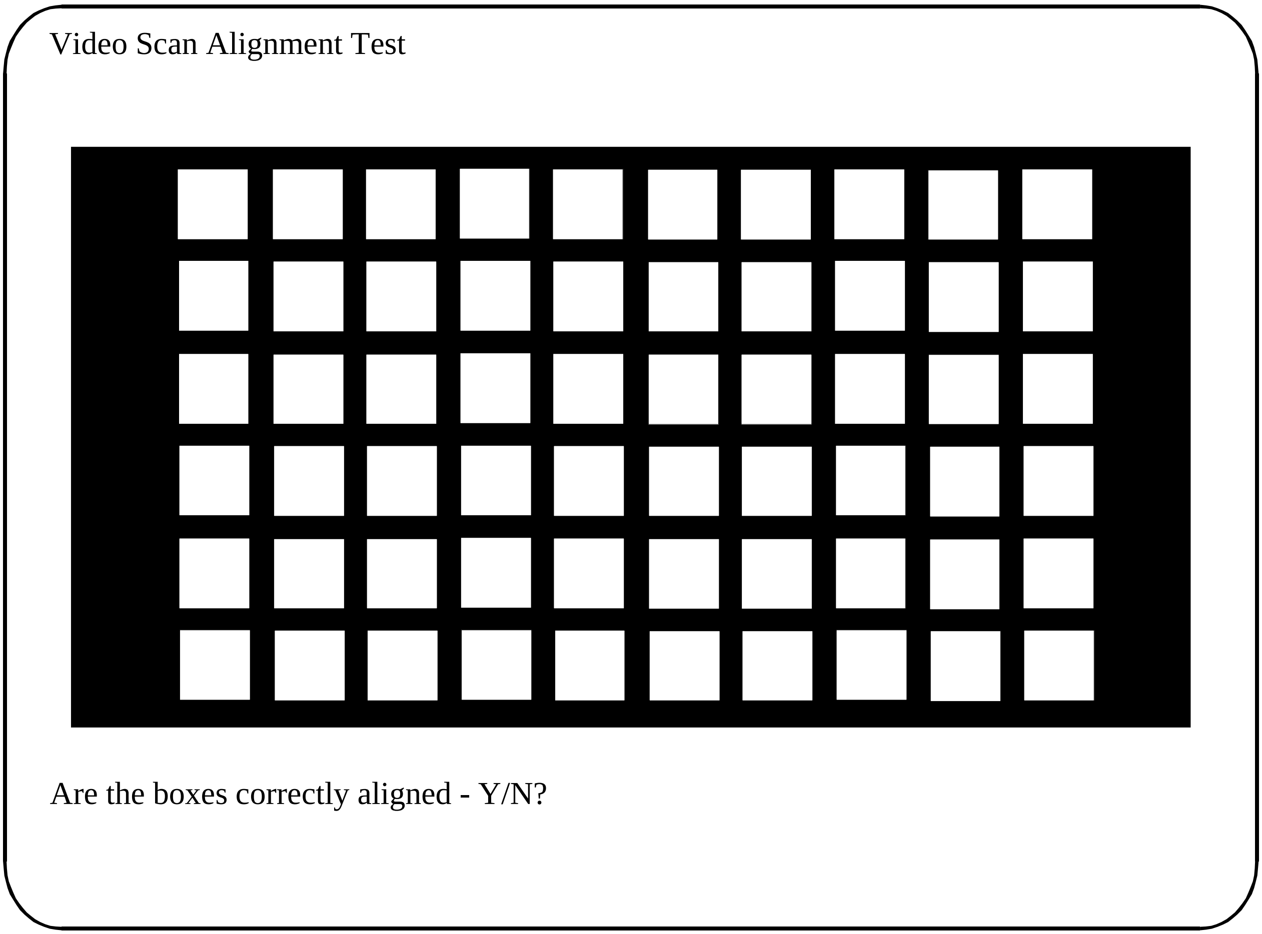


Figure A-4. Video Scan Alignment Subtest (Screen 2)

Character Attributes Subtest (40 x 25)

The 40-column x 25-line character attributes subtest displays four lines of text in 40-column by 25-line (double-wide) text mode that demonstrate normal-intensity video, reverse video, intensified video, and blinking video. Figure A-5 shows an example of the 40-column x 25-line character attributes subtest screen.

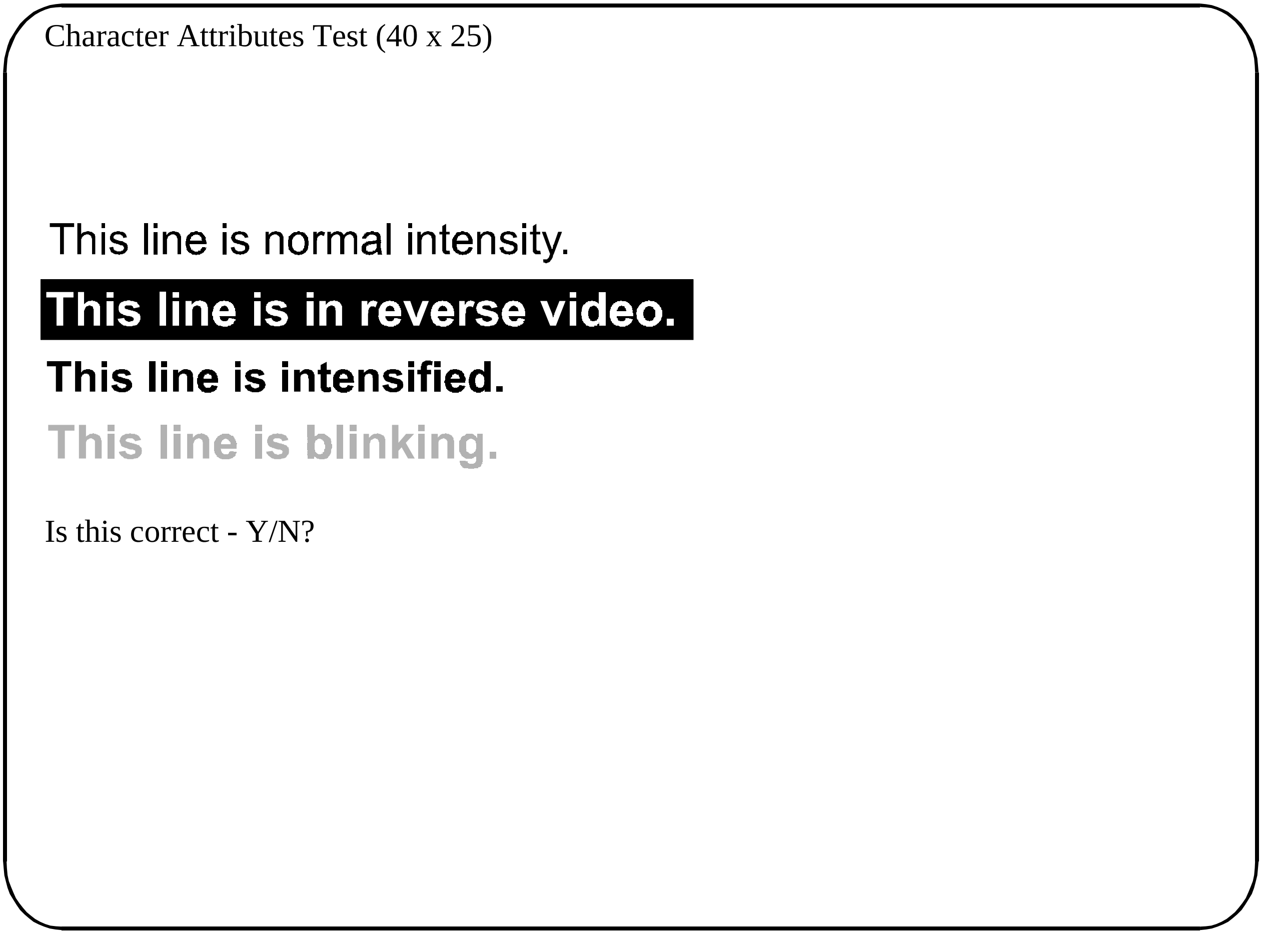


Figure A-5. 40-Column x 25-Line Character Attributes Subtest Screen

Character Set Subtest (40 x 25)

The 40-column x 25-line character set subtest displays all 256 characters in the ASCII character set in 40-column by 25-line (double-wide) text mode. Figure A-6 shows an example of the 40-column x 25-line character set subtest screen.

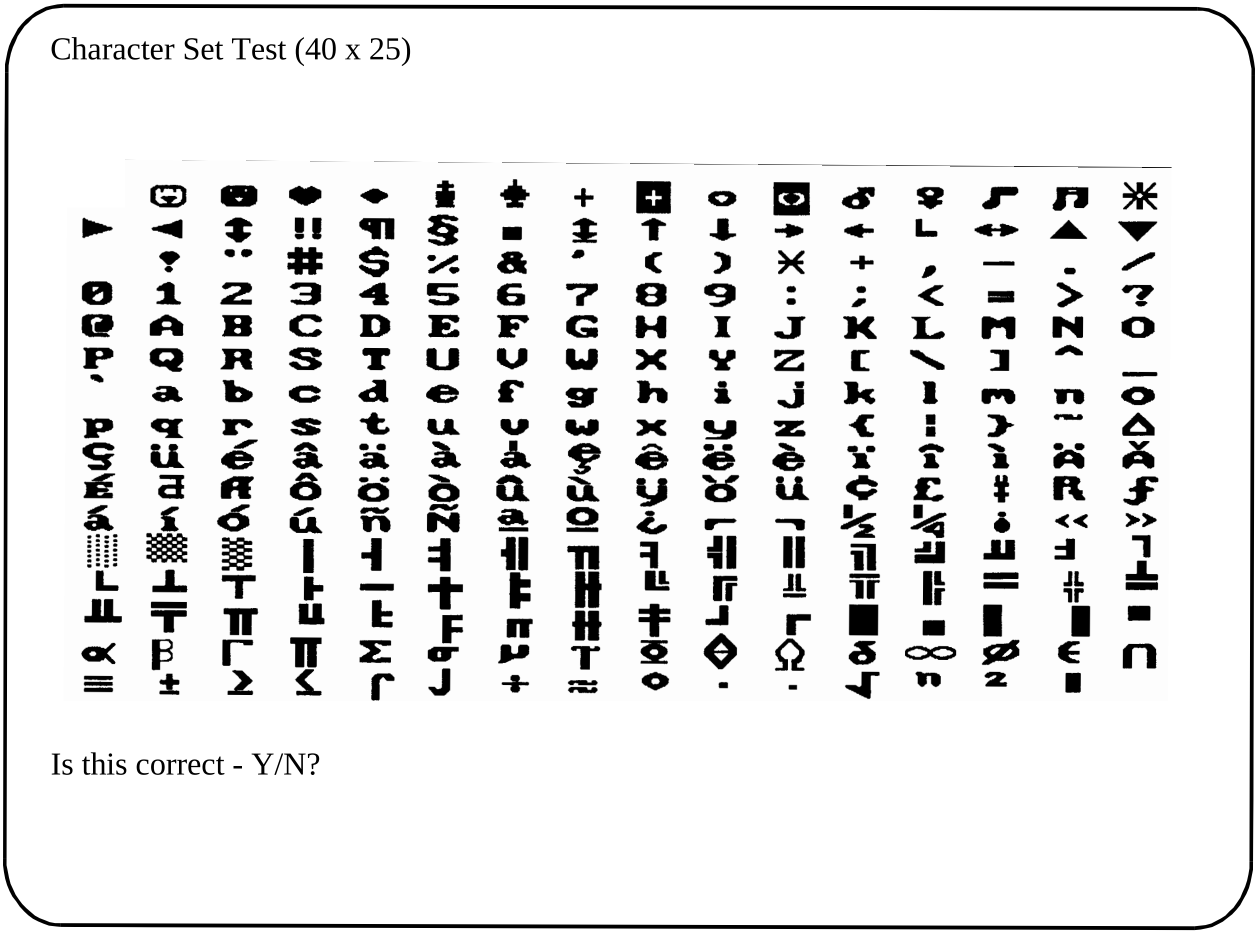


Figure A-6. 40-Column x 25-Line Character Set Subtest Screen

Text Mode Color Test

The Text Mode Color Test contains three subtests that check the video subsystem's ability to present color in text modes. The following subsections describe these subtests.

NOTE: These subtests are valid for color monitors only.

Color Attributes Subtest (80 x 25)

The 80-column x 25-line color attributes subtest displays a pattern of 16 rows and 16 columns in 80-column by 25-line text mode. Each row has a hexadecimal number in a unique foreground color and each column has a unique background color. Where the same foreground and background color intersect, the hexadecimal number is not visible. Type y if each character is displayed correctly; otherwise, type n. Table A-1 indicates the color in each of the rows and columns.

Table A-1. Color Attributes

Row or Column Number	Foreground Color	Background Color
0	black	black
1	blue	blue
2	green	green
3	cyan	cyan
4	red	red
5	magenta	magenta
6	brown	brown
7	white	white
8	dark gray*	black
9	light blue*	blue
A	light green*	green
B	light cyan*	cyan
C	light red*	red
D	light magenta*	magenta
E	yellow*	brown
F	intense white*	white

* *These colors blink during the test.*

Color Attributes Subtest (40 x 25)

The 40-column x 25-line color attributes subtest is the same as the previous subtest except that the characters are displayed in 40-column by 25-line (double-wide) text mode. Type `y` if each character is displayed correctly; otherwise, type `n`.

Color Bars Subtest

The color bars subtest displays 16 bars in different colors with background intensity enabled. Under each bar is the name of the color that should be displayed. Type `y` if each color bar is displayed correctly; otherwise, type `n`.

Text Mode Pages Test

The Text Mode Pages Test checks the video subsystem's ability to map and present all available video pages on the monitor screen, one page at a time. The test displays eight successive screens, the first of which contains 21 lines of 77 zeros. The remaining seven screens are identical to the first, except that each screen substitutes a different numeral (1 through 7) for the zeros.

Type `y` if all the rows of numbers on each screen are displayed correctly; otherwise, type `n`. Figure A-7 shows an example of the first of these screens.

```
Video Text Pages Test 0


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Is this video page correct - Y/N?
```

Figure A-7. Text Mode Pages Test Screen

Graphics Mode Test

The Graphics Mode Test checks the video subsystem's ability to present graphics mode data and colors. This test displays nine different screens, each of which allows you to check some aspect of graphics mode data and colors. The following subsections describe Graphics Mode Test screens in the order in which they appear.

NOTE: Some of the following tests may not appear if your system does not support the video mode being tested.

320 x 200 Graphics Mode Screens

The Graphics Mode Test displays two successive 320- x 200-pixel graphics mode screens: The first screen displays three pyramids in red, green, and yellow. The second screen displays three pyramids in magenta, cyan, and white. Type `y` if all the pyramids are the correct colors; otherwise, type `n`.

640 x 200 Black/White Graphics Mode Screen

The 640- x 200-pixel black/white graphics mode screen displays a black rectangle and a white rectangle on a gray background. Type `y` if the boxes are displayed correctly; otherwise, type `n`. Figure A-8 shows an example of this screen.

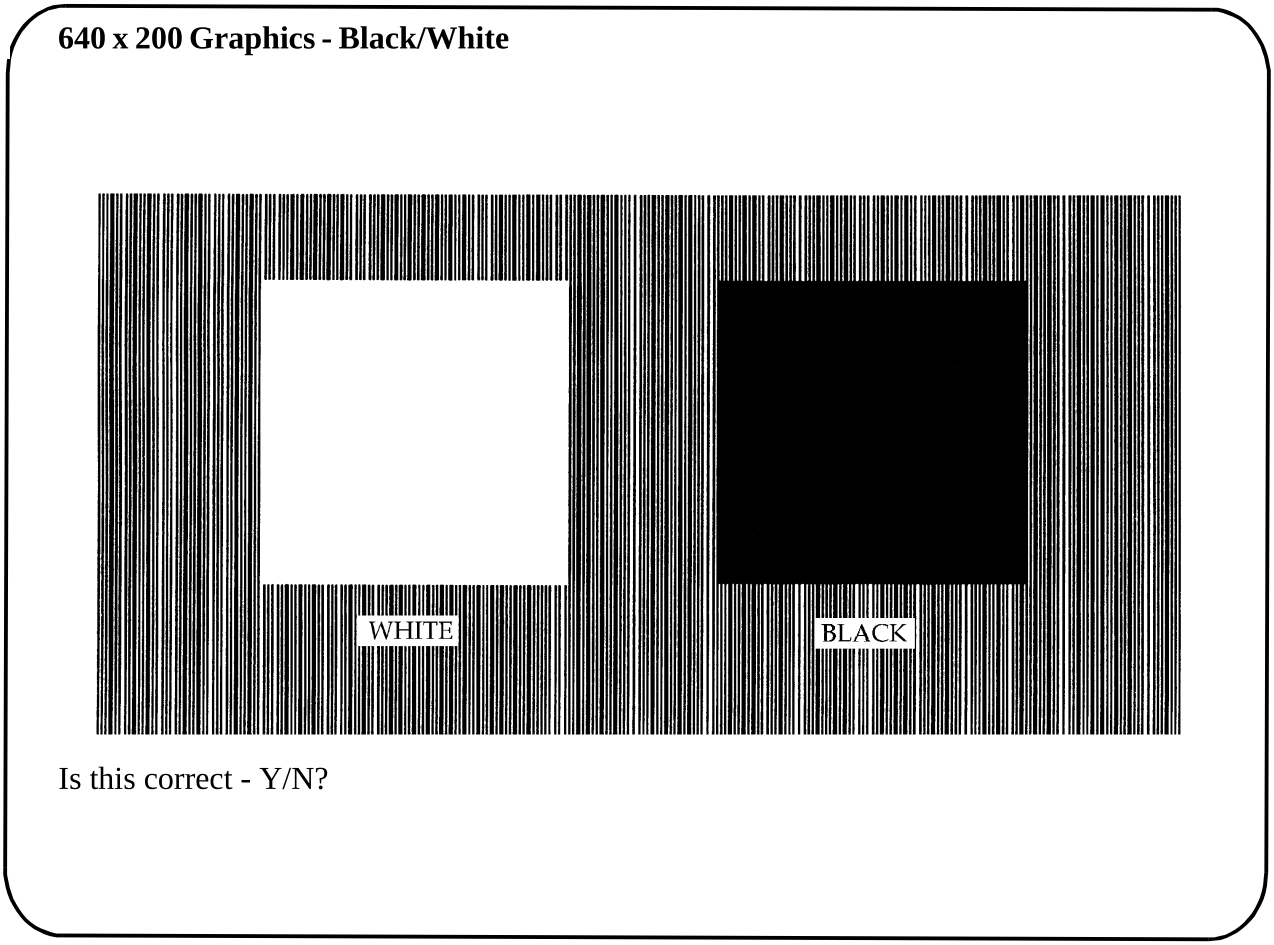


Figure A-8. 640 x 200 Black/White Graphics Mode Screen

640 x 480 Monochrome Graphics Mode Screen

The 640- x 480-pixel monochrome graphics mode screen displays three chess pieces. Type y if all the chess pieces are identical and displayed correctly; otherwise, type n. Figure A-9 shows an example of this screen.

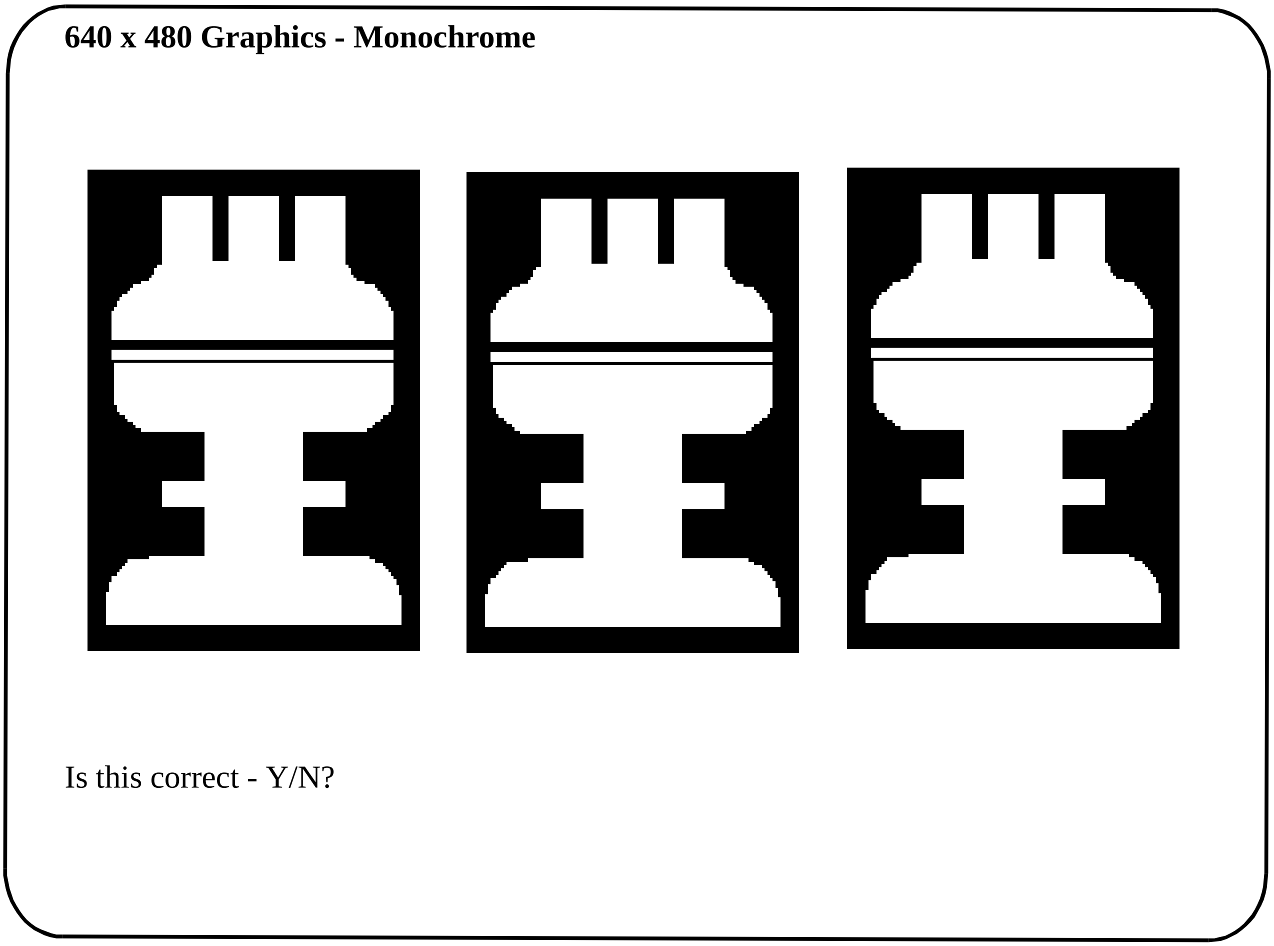


Figure A-9. 640 x 480 Monochrome Graphics Mode Screen

320 x 200 16-Color Graphics Mode Screen

The 320- x 200-pixel 16-color graphics mode screen displays a series of Xs in 16 different colors with the name of the color beneath each X. Type y if all the Xs are the correct colors; otherwise, type n.

640 x 200 16-Color Graphics Mode Screen

The 640- x 200-pixel 16-color graphics mode screen displays a series of hexagons in 16 different colors with the name of the color beneath each hexagon. Type y if all the hexagons are the correct colors; otherwise, type n.

640 x 350 16-Color Graphics Mode Screen

The 640- x 350-pixel 16-color graphics mode screen displays a series of octagons in 16 different colors with the name of the color displayed beneath each octagon. Type y if all the octagons are the correct colors; otherwise, type n.

640 x 480 2-Color Graphics Mode Screen

The 640- x 480-pixel 2-color graphics mode screen displays three chess pieces. Type y if all the chess pieces are identical and displayed correctly; otherwise, type n. Figure A-10 shows an example of this screen.

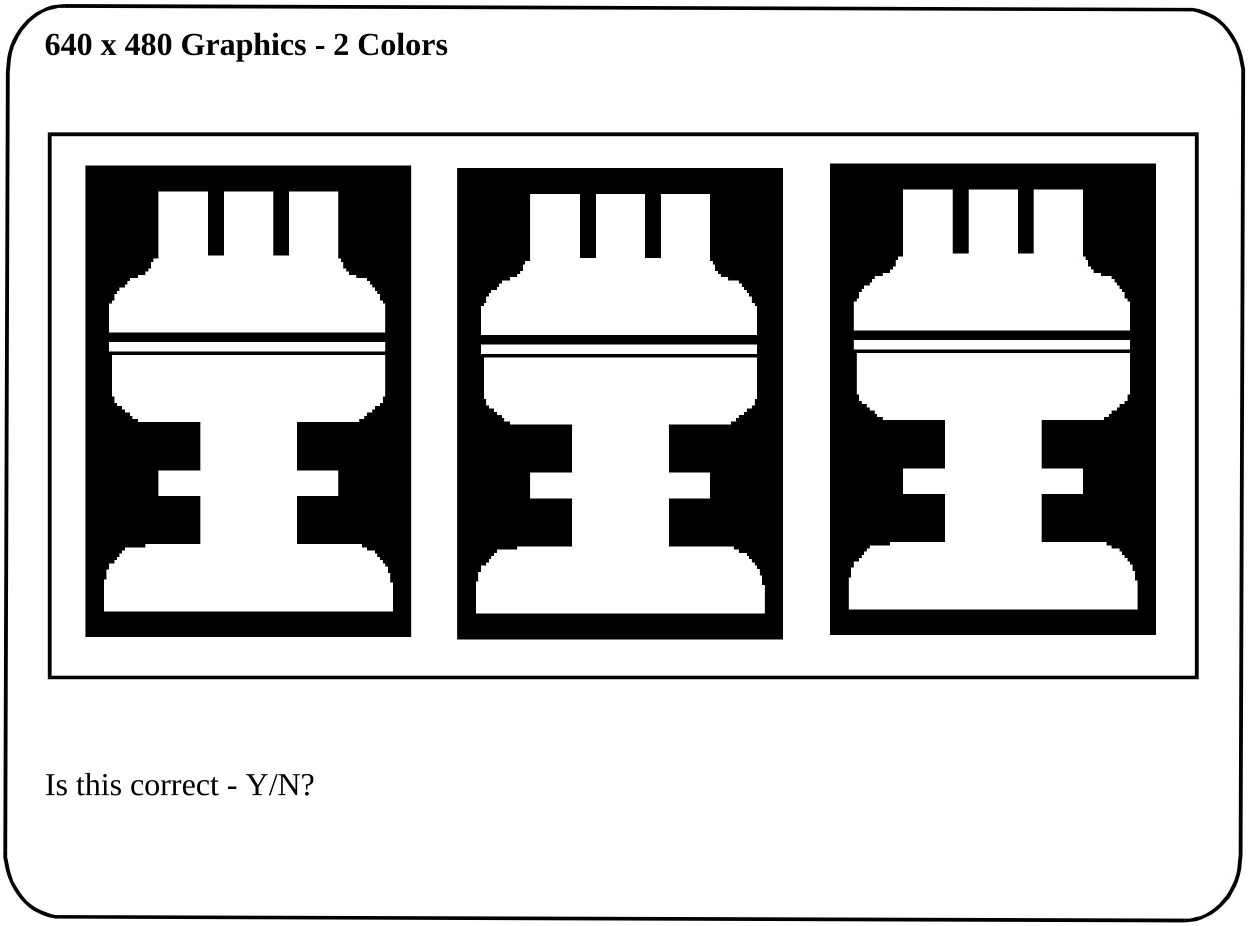


Figure A-10. 640 x 480 2-Color Graphics Mode Screen

640 x 480 16-Color Graphics Mode Screen

The 640- x 480-pixel 16-color graphics mode screen displays a series of stars in 16 different colors with the name of the color beneath each star. Type y if all the stars are the correct colors; otherwise, type n.

320 x 200 256-Color Graphics Mode Screen

The 320- x 200-pixel 256-color graphics mode screen displays a series of squares in 256 different color hues and intensities. Type y if all the squares are the correct colors; otherwise, type n.

640 x 480 256-Color Graphics Mode Screen

The 640- x 480-pixel 256-color graphics mode screen displays a series of squares with two colors in each square. Type y if all the squares appear to be correct; otherwise, type n.

800 x 600 16-Color Graphics Mode Screen

The 800- x 600-pixel 16-color graphics mode screen displays a series of pyramids in 16 different colors. Type y if all the pyramids appear to be correct; otherwise, type n.

800 x 600 256-Color Graphics Mode Screen

The 800- x 600-pixel 256-color graphics mode screen displays a series of squares with four colors in each square. Type y if all the squares appear to be correct; otherwise, type n.

1024 x 768 16-Color Graphics Mode Screen

The 1024- x 768-pixel 16-color graphics mode screen displays a series of hourglasses in 16 different colors. Type y if all the hourglasses appear to be correct; otherwise, type n.

1024 x 768 256-Color Graphics Mode Screen

The 1024- x 768-pixel 256-color graphics mode screen displays a series of asterisks with four colors in each asterisk. Type y if all the asterisks appear to be correct; otherwise, type n.

1280 x 1024 16-Color Graphics Mode Screen

The 1280- x 1024-pixel 16-color graphics mode screen displays a series of squares in 16 different colors located in various positions on the screen. Type y if all the squares appear to be correct; otherwise, type n.

Color Palettes Test

The Color Palettes Test checks the video subsystem's ability to display all available colors. The test displays two screens that allow you to check the quality of different shades of the basic colors and to test the monitor's ability to vary the intensity of these colors.

The first screen contains four sets of 64 squares, one for gray and one for each of the three basic colors (red, green, and blue). Each square contains a different shade of its associated color, ranging from very light to very dark. Type y if all the squares are the correct colors; otherwise type n.

The second screen is the red/green/blue (RGB) color combination screen. This screen allows you to test the monitor's ability to increase or decrease the intensity of the three basic colors.

The RGB color combination screen displays an RGB box in the top center of the screen with individual red, green, and blue boxes beneath it. Underneath the individual color boxes are three lines that show the intensity of each color. Type r, g, or b to adjust the intensity of the corresponding color; then press the right-arrow key to increase the color intensity, or press the left-arrow key to decrease the intensity. The RGB box should be able to display 262,144 different colors when you adjust the intensity levels of red, green, and blue. Type y if all the squares are the correct colors; otherwise type n.

Solid Colors Test

The Solid Colors Test checks whether the video subsystem is displaying the correct colors. This test also lets you check for missing pixels. When this test is running, four screens appear sequentially—a red screen, a green screen, a blue screen, and a white screen. Check each screen for missing pixels, and verify that the correct color is being displayed.

When the test is complete, a message asks if you are satisfied with the quality of the colors. Type `y` if all the pixels were present and if the correct colors were displayed; otherwise, type `n`.

Abbreviations and Acronyms

Abbreviation or Acronym	Description
A	ampere(s)
AC	alternating current
ADC	analog-to-digital converter
ADI	Autodesk Device Interface
AI	artificial intelligence
ANSI	American National Standards Institute
ASCII	American Standard Code for Information Interchange
ASIC	application-specific integrated circuit
BASIC	Beginner's All-Purpose Symbolic Instruction Code
BBS	bulletin board service
BIOS	basic input/output system
bpi	bits per inch
bps	bits per second
BTU	British thermal unit
BZT	Bundesamt fur Zulassungen in der Telekommunikation
C	Celsius
CCFT	cold cathode fluorescent tube
CD	compact disc

Abbreviation or Acronym	Description
CD-ROM	compact disc read-only memory
CGA	color graphics adapter
cm	centimeter(s)
CMOS	complementary metal-oxide semiconductor
C.O.D.	collect on delivery
cpi	characters per inch
cpl	characters per line
CPU	central processing unit
DAC	digital-to-analog converter
DASH	Dell Advanced SCSI Host
DAT	digital audio tape
dB	decibel(s)
dBA	adjusted decibel(s)
DC	direct current
DIN	Deutsche Industrie Norm
DIP	dual in-line package
DMA	direct memory access
DOC	Department of Communications (in Canada)
dpi	dots per inch

Abbreviation or Acronym	Description
DRAM	dynamic random-access memory
DS/DD	double-sided double-density
DS/HD	double-sided high-density
DSA	Dell SCSI Array
ECC	error correction code
EGA	enhanced graphics adapter
EIDE	enhanced integrated drive electronics
EISA	Extended Industry-Standard Architecture
EMI	electromagnetic interference
EMM	expanded memory manager
EMS	Expanded Memory Specification
EPP	Enhanced Parallel Port
EPROM	erasable programmable read-only memory
ESD	electrostatic discharge
ESDI	enhanced small-device interface
ESM	embedded server management
F	Fahrenheit
FAT	file allocation table
FCC	Federal Communications Commission
FIFO	first-in first-out
ft	feet
g	gram(s)
G	gravities
GB	gigabyte(s)

Abbreviation or Acronym	Description
GUI	graphical user interface
h	hexadecimal
HMA	high memory area
HPFS	High Performance File System
Hz	hertz
I/O	input/output
ID	identification
IDE	integrated drive electronics
IR	infrared
IRQ	interrupt request
ISA	Industry-Standard Architecture
JEIDA	Japanese Electronic Industry Development Association
K	kilo- (1024)
KB	kilobyte(s)
KB/sec	kilobyte(s) per second
Kbit(s)	kilobit(s)
Kbit(s)/sec	kilobit(s) per second
kg	kilogram(s)
kHz	kilohertz
LAN	local area network
lb	pound(s)
LCD	liquid crystal display
LED	light-emitting diode
LIF	low insertion force
LN	load number
LIM	Lotus/Intel/Microsoft

Abbreviation or Acronym	Description
lpi	lines per inch
m	meter(s)
mA	milliampere(s)
mAh	milliampere-hour(s)
MB	megabyte(s)
MBR	master boot record
MDA	monochrome display adapter
MGA	monochrome graphics adapter
MHz	megahertz
mm	millimeter(s)
ms	millisecond(s)
MS-DOS	Microsoft Disk Operating System
MTBF	mean time between failures
mV	millivolt(s)
NIC	network interface controller
NiCad	nickel cadmium
NiMH	nickel-metal hydride
NMI	nonmaskable interrupt
ns	nanosecond(s)
NTFS	NT File System
NVRAM	nonvolatile random-access memory
OS/2	Operating System/2
OTP	one-time programmable
PAL	programmable array logic
PCI	Peripheral Component Interconnect

Abbreviation or Acronym	Description
PCMCIA	Personal Computer Memory Card International Association
PGA	pin grid array
POST	power-on self-test
ppm	pages per minute
PQFP	plastic quad flat pack
PS/2	Personal System/2
PVC	polyvinyl chloride
QIC	quarter-inch cartridge
RAM	random-access memory
RAMDAC	random-access memory digital-to-analog converter
REN	ringer equivalence number
RFI	radio frequency interference
RGB	red/green/blue
ROM	read-only memory
rpm	revolutions per minute
RTC	real-time clock
SCSI	small computer system interface
sec	second(s)
SIMM	single in-line memory module
SRAM	static random-access memory
SVGA	super video graphics array
TFT	thin film transistor
tpi	tracks per inch
TSR	terminate-and-stay-resident
TV	television

Abbreviation or Acronym	Description
UL	Underwriters Laboratories
UMB	upper memory block
UPS	uninterruptible power supply
USB	universal serial bus
USOC	Universal Service Ordering Code
V	volt(s)
VAC	volt(s) alternating current
VDC	volt(s) direct current
VDE	Verband Deutscher Elektrotechniker
VESA	Video Electronics Standards Association
VGA	video graphics array
VLSI	very-large-scale integration
VRAM	video random-access memory
W	watt(s)
WH	watt-hour(s)
XMM	extended memory manager
XMS	eXtended Memory Specification
ZIF	zero insertion force

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